60463440 A

CONTROL DATA

CDC® CYBER 180 COMPUTER SYSTEM MODELS 845S, 855S, 840A, 850A, AND 860A

CENTRAL PROCESSOR

MAINTENANCE PARTS DATA

HARDWARE MAINTENANCE MANUAL

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or use Comment Sheet in the back of this manual.

MANUAL TO EQUIPMENT LEVEL CORRELATION SHEET

This manual reflects the equipment configurations listed below.

EXPLANATION: Locate the equipment type and series number, as shown on the equipment FCO log, in the list below. Immediately to the right of the series number is an FCO number. If that number and all of the numbers underneath it match all of the numbers on the equipment FCO log, then this manual accurately reflects the equipment.

EQUIPMENT TYPE	SERIES	WITH FCOs	COMMENTS
AD112-C		-	Released.
AD113-A			
BS213-A			
BS215-A			
AT487-A			
AT487-B			
AT487-C			

LIST OF EFFECTIVE PAGES

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PREFACE

This manual is for use by experienced field personnel who are familiar with CONTROL DATA® computing systems and Control Data maintenance practices. The manual provides detailed maintenance information for the following CDC CYBER 170/180 models 845S, 855S, 840A, 850A, and 860A equipment:

Central Processor/CMC (AD112-C)
Central Processor/CMC (AD112-S)
Central Storage Unit (BS213-A)
Model 840 Performance Option (AT487-C)
Model 850 Performance Option (AT487-A)
Model 860 Performance Option (AT487-B)
Model 845S Performance Option (AT494-A)
Model 855S Performance Option (AT494-B)

The information in this manual supplements the maintenance software manuals and the theory and diagrams manuals. It contains the following sections:

Introduction
Maintenance Aids
Preventive Maintenance
Corrective Maintenance
Field Removal and Replacement
Parts Data

The maintenance aids section is a convenient collection of tables and charts that assist in maintenance. Included are such items as lists of special tools and test equipment, soft control memory maps, and RAM contents. These definitions include references between the bits and associated diagrams. Other lists contain sync and test points for scoping during troubleshooting.

Preventive maintenance contains the computer automated maintenance scheduling (CAMS) list, which is a preventive maintenance program tailored to models 845S, 855S, 840A, 850A, and 860A. Detailed procedures in this section may also be of use during troubleshooting (for example, the running of voltage or clock margins).

Corrective maintenance assists in the areas of board cleaning, circuit continuity measurements, and clock tuning. The clock tuning procedures include detailed waveforms illustrated for comparison to scoped traces.

Field removal and replacement provides procedures for the removal and replacement of the physical components of the processor and memory including arrays, boards, and pins. The procedures are detailed and liberally illustrated. They have been verified on the equipment in a carefully controlled environment and are to be followed precisely to prevent personal injury or damage to the equipment.

Parts data identifies the replaceable parts by part number and description.

A system publication index on the following page lists other manuals that are applicable to models 845S, 855S, 840A, 850A, and 860A.

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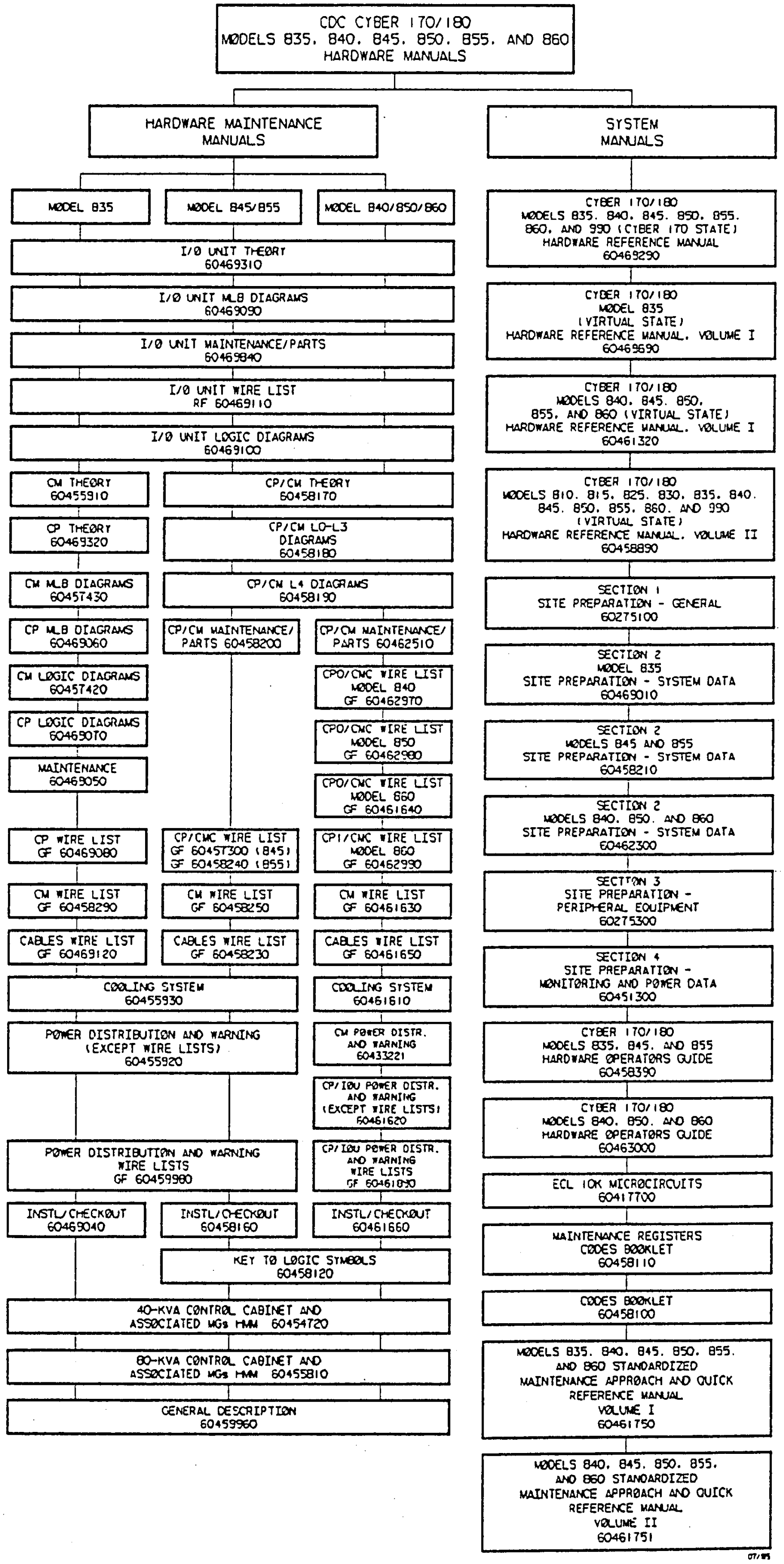
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CYBER 170/180 MODELS 840, 845, 850, 855, AND 860 (VIRTUAL STATE) HARDWARE REFERENCE MANUAL, VOLUME I 60461320
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INTRODUCTION

MAINTENANCE FUNCTION

The maintenance function at a field location is essentially the same for both simple and complex computer installations. The equipment must be kept under observation, and its condition must be continually optimized through scheduled maintenance routines. Unscheduled maintenance must be performed whenever a hardware failure interrupts operation.

There are two basic types of maintenance: preventive and corrective. Preventive maintenance procedures limit downtime by anticipating and averting problems. These procedures are performed during scheduled maintenance periods, while the equipment is operational. They significantly reduce random interruptions and downtime caused by maladjustments and equipment failure. Preventive maintenance procedures include lubrication, cleaning, running test programs, and checking circuit parameters for marginal conditions.

Corrective maintenance is the systematic isolation of a problem to a specific circuit board or component, and the repair, replacement, or readjustment of that item. The need for corrective maintenance may be indicated by the preventive maintenance investigation or by an equipment failure.

Maintenance personnel also perform a variety of related tasks including:

- Modifying equipment in compliance with field change orders.
- Making required configuration changes at the site.
- Serving as technical advisors to the customer.
- Controlling work scheduling, test equipment, replacement parts and subassemblies, tools, and documentation at the site.

PREVENTIVE MAINTENANCE

Routinely performed procedures, designed to keep equipment operating at peak efficiency, can avoid many failures. One of the most important aspects of preventive maintenance is cleanliness. Unless the computer area is kept clean, faults due to dirt, dust, cigarette ashes, and so on, eventually occur. Cleanliness should be a constant consideration.

Mechanical connections, adjustments, and lubrication procedures are frequently neglected. Visual inspection of mechanical devices should occur at regular intervals.

Distribution of ac power to the computer system and distribution of dc voltages in the system have a direct effect upon operation. These voltages must be within specified limits prior to making other adjustments. They must then be maintained within limits of marginal operation; if they are not, complete failure may result.

Routinely performed measurements of circuit parameters may indicate the need for a minor adjustment. These measurements may reveal the need to replace a deteriorating circuit board or component. Voltage, current, and waveform analysis play an important role in a successful preventive maintenance program.

Diagnostic program routines are also valuable. Standard tests, which increase the possibility of predicting probable failing areas, are available. To be fully utilized, these maintenance tests must be run periodically. If they are used only to localize a problem or to distinguish between hardware and software, much of their value is wasted.

CORRECTIVE MAINTENANCE

Recognition of a problem, location of the fault, and correction of the fault are the three steps involved when normal operation is endangered or interrupted. Corrective maintenance troubleshooting is the use of techniques that locate and correct the fault.

When a problem is recognized in a system, the trouble must be localized to a general area as quickly as possible. The system operator should save samples of the output that indicates the malfunction and symptoms. When a malfunction is indicated, the operator should be consulted for information regarding the nature of the symptom, the equipment configuration, and so on.

The exact nature of the failure must be determined. The control console may be used to reproduce the error by running a diagnostic program. If the error cannot be reproduced, an operator error, a marginal fault, or an intermittent failure is indicated.

Once the fault is isolated to a specific functional area, it must be further analyzed to determine which one of the circuit boards is failing. If the fault can be isolated to a circuit board, by either scoping or exchanging boards, the faulty board should be replaced.

Intermittent temperature faults are usually caused by a bad internal connection or component in a circuit board that is subjected to temperature variations. The faults are difficult to locate because they occur only at certain temperature and stress conditions. The problem may be solved by changing boards in the failing area until the fault is eliminated. Boards must always be properly seated in their connectors. The heat generated in a board cannot be radiated to the cooling system unless the board is properly seated.

Intermittent continuity errors are often caused by loose wires, loose cables, defective cable connectors, or defective board components. They can be detected by shock testing individual boards and agitating wires and cables while a diagnostic program is running.

It is important to accumulate and preserve as many facts as possible about intermittent failures. The first time a problem occurs, write down all information available. If the failure occurs again, a pattern may be recognized.

Experience and a thorough knowledge of the equipment are the key factors in solving intermittent problems. To gain thorough knowledge of the equipment, a self-initiated, self-maintained study program should begin as soon as possible after formal training on the equipment has been completed.

After a suspected fault is located and corrected, the failing circuit should be rechecked. It is not unusual to find and remedy a fault without solving the operating problem. This can be caused by either a multiple failure or the existence of a faulty circuit that has not been recently activated.

When a fault is isolated to a specific circuit board, further troubleshooting to determine the defective part on the board is not necessary. When a board is defective, it should be replaced with a spare one. Defective boards must not be repaired in the field; they must be returned to the factory. In addition to repair under laboratory conditions, detailed engineering review and statistical analysis is then possible. Refinements in component selection for the boards can be made if a trend appears to be developing. The maintenance log should give a thorough description of the type of failure, the means of locating it, and the method of correction. Solved problems are valuable sources for future reference.

NOTE

Unsolved problems must be properly logged to prevent duplication of unsuccessful diagnostic efforts by other personnel.

MAINTENANCE AIDS

The following tables, figures, and related text provide information to supplement the normal maintenance practices and procedures in the remainder of the manual. Some of the information is general and may have varying applications according to the maintenance being performed.

FUNCTIONAL REQUIREMENT

After any maintenance and a final application of power to the CP, run the command buffer test ALLMD3 to provide a functional check of the CP.

SPECIAL TOOLS, TEST EQUIPMENT, AND MATERIALS

Tables 2-1, 2-2, and 2-3 list the special tools, test equipment, and materials that are necessary for maintenance of the central processor (CP) and central memory (CM).

Table 2-1. Special Tools (Sheet 1 of 4)

Part Number	Description	Use
12263499	Antistatic bag	Protecting small static-sensitive parts during handling and transporting
00217372	Antistatic box, LSI	Protecting larger static-sensitive parts during handling and transporting
12263495	Antistatic pad	Providing a grounded work surface for static-sensitive parts
12263496	Antistatic wrist strap, large	Grounding maintenance personnel while working on equipment
12263623	Antistatic wrist strap, small	Grounding maintenance personnel while working on equipment

Table 2-1. Special Tools (Sheet 2 of 4)

Part Number	Description	Use
00213164	Array removal tool	Removing large scale integration (LSI) arrays and LSI half-pak arrays
00205366	Broken-pin removal tools	Removal of LSI pins
52948476	CM board extender	Extending CM logic boards from chassis
91915206	CM board extender	Extending CM array boards from chassis
23004600	Coax clip removal tools	Removal of retainer clips from coax backpanels
23004660	Coax wire connector removal tool	Removal of coax connectors from backpanels
53705665 and 23142078	Connector repair kit for CM	Removal and replacement of CM backpanel connector pins
53705665 and 53812060	Connector repair kit for ZIF backpanel	Removal and replacement of CP zero insertion force (ZIF) cage backpanel connector pins
53705652	Drain hose (two required)	Removal and replacement of ZIF cage cold plate assemblies
12263585	Drill bit, no. 74, 0.57 mm (0.0225 in)	Enlarging pin holes in LSI boards for insulated pin replacements
23004661	Emergency array holder	Temporary repair of LSI panel assemblies
21987490	Forceps (needle holder)	General
12263461	Funnel, folding	Adding water
	Hammer, plastic-head, 4 oz†	Tapping out pins from LSI boards
	Hex key set†	General

† If not available at site, obtain through local purchase.

Table 2-1. Special Tools (Sheet 3 of 4)

Part Number	Description	Use
00213354	Insertion press, backup plate, shims, insertion press 24/26-pin adapter	Replacement of 26-, 24-, or 50-pin connectors in LSI panels
	Long-nose pliers †	General
23004661	LSI emergency array holder	Temporary replacement of spring clips
00219492	LSI panel (board) stiffener	Replacement of LSI panel assemblies in chassis
00218976	LSI panel stiffener protective box	Protective storage for stiffener.
00213470	Male coax pin insertion tool without guide	Installing male coax pins in LSI boards
00217093	Male coax pin insertion tool with guide	Installing male coax pins in LSI boards
12263483 12263484 12263485	Microscope: Stand Arm	Installing insulated LSI panel pins and general inspection
00217329	Pin coordinate locator	Locating LSI panel pins
12263417	Pin vise	Holding no. 74 drill bit
18988244	Power bus board straightener	Flattening power bus board
51730100	Safety glasses	Removal and replacement of LSI spring clips
	Screwdriver, 3/16-in plastic† blade	Removal of retainers from 48- or 52-pin connector assemblies
	Screwdriver, no. 1 Phillips †	General
	3/16-in socket †	Removal and replacement of ZIF interconnect boards and ZIF cage cold plate assembly
	1/2-in to 3/8-in drive adapter †	General
	Soldering iron, 30 W †	Removal and replacement of insulated male coax pins

†If not available at site, obtain through local purchase.

Table 2-1. Special Tools (Sheet 4 of 4)

Part Number	Description	Use
12263294	Solvent spray brush for aerosol spray can	Cleaning of circuit boards
00219510	Spring clip removal tool, 48-pin	Removal and replacement of LSI spring clips
00219509	Spring clip removal tool, 52-pin	Removal and replacement of LSI half-pak spring clips
12210275	Tweezers (2 required)	Replacement of LSI panel insulated pins
12259183	Unwrap tool	Removal of CM backpanel wires
12259111	Wire-wrap gun	Replacement of CM backpanel wires
	Wrenches:	
	Drive wrench set, 1/4-in drive, with 6-in extender†	General
	Ratchet wrench set, 1/4-in drive, with 6-in extender†	General
	3/8-in open-end wrench†	Removal and replacement of ZIF interconnect boards
	7/16-in open-end wrench†	Removal and replacement of ZIF interconnect boards
	3/16-in box-end wrench†	Removal and replacement of ZIF interconnect boards
21935406	ZIF alignment gauge (two required)	Replacement of ZIF interconnect boards
24614635	ZIF board extender	Extending ZIF boards from chassis
23004655	20-pin connector removal tool	Replacement of connectors on ZIF interconnect board
53705483	100-K scope clip	Extending individual microcircuit 24-pin contacts

†If not available at site, obtain through local purchase.

Table 2-2. Special Test Equipment

Part Number	Description	Use
12263451	Current limited power supply (Lambda LP-530-FM or LQ-530)	Performing short circuit tests on LSI panels and CP columns
12263279	Multimeter (John Fluke DVM, 8020A)	General
12263466	Shunt, 10 A to 100 mV (John Fluke, 80J-10)	Performing current limit tests

Table 2-3. Special Materials

Part Number	Description	Use
	Adhesive (Eastman 910)†	Assembling of insulated male coax pins
	Cable ties†	General
	Distilled water†	General
12263512	Freon TMS in aerosol spray can	Cleaning of circuit boards
12263513	MS-170 1,1,1-trichloroethane solvent in aerosol spray can	Cleaning of circuit boards
12210948	Tape, black vinyl	Installation of thermistors
	Tape, double-backed (included with insertion press)†	Holding shims on rear of LSI panels during connector replacement
94211400	Texwipe lint-free disposable cloths	Cleaning of circuit boards

†If not available at site, obtain through local purchase.

COMMON OSCILLOSCOPE SYNC TEST POINTS

Commonly used test points (TP) for synchronizing an oscilloscope during troubleshooting techniques are on the CP zero insertion force (ZIF) cage C1, board C, and the auxiliary board at large scale integration (LSI) panel assembly location B2K (lower). The test points are shown in table 2-4.

Table 2-4. Common Oscilloscope Sync Test Points

Test Point	Signal	Description
C1C TP16	Processor halted	Any of several conditions, including a master clear, produces this signal. It is useful as a basic starting point in a troubleshooting process.
C1C TP44	Breakpoint compare (rank 13 at time 20.5)	This signal occurs when the breakpoint address in the microcode address register is reached. The address is set by entering a keyboard command of ER2,32,XXX (XXX is the breakpoint address). Bit 44 in the dependent environment control (DEC) register 30 must be clear for a breakpoint compare.
B2K Lower TP98	Breakpoint compare (rank 22 at time 30)	
B2K Lower TP99	Breakpoint compare (rank 32 at time 32)	
B2K Lower TP100	Breakpoint compare (rank 41 at time 41)	The trailing edge of this signal, at rank 41, is the equivalent of the leading edge of the breakpoint compare signal at rank 50.

TEST POINTS

The following CP test point descriptions cover the LSI circuits in the LSI panel assemblies and the central memory control (CMC) paks in the ZIF cages.

LSI TEST POINTS

Figure 2-1 identifies the test point locations (input/output pins) on the LSI half-pak arrays and LSI arrays. Test point charts in this section further identify the test points according to the array types. Identifiers of the array types are at the tops of the charts. Within the charts, pin names are in alphanumeric order. All pin names and corresponding test points above horizontal dividing lines in the charts are array inputs and all pins below the lines are array outputs.

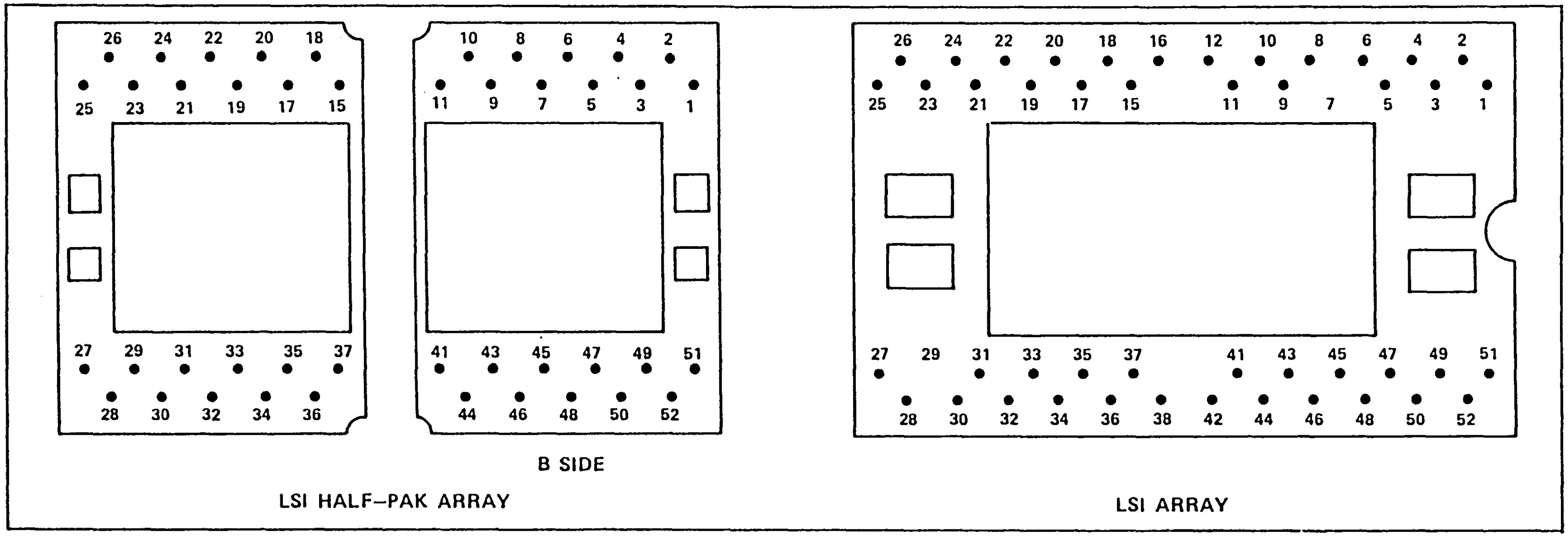


Figure 2-1. LSI Test Points

Test Point Charts for LSI Half-Pak Arrays

121HA COMPARATOR

PIN NAME	TEST POINT	
	A	B
A(0)	18	44
A(1)	36	10
A(2)	34	08
A(3)	32	06
A(4)	30	14
A(5)	24	50
A(6)	22	48
A(7)	20	46
B(0)	15	41
B(1)	35	09
B(2)	33	07
B(3)	31	05
B(4)	29	03
B(5)	21	47
B(6)	19	45
B(7)	17	43
T1	25	51

121HA PARITY

PIN NAME	TEST POINT	
	A	B
A(0)	20	46
A(1)	19	45
A(2)	22	48
A(3)	21	47
A(4)	24	50
A(5)	15	41
A(6)	18	44
A(7)	17	43
API	23	49
B(0)	29	03
B(1)	30	04
B(2)	31	05
B(3)	32	06
B(4)	33	07
B(5)	34	08
B(6)	35	09
B(7)	36	10
BPI	28	02
AT1	26	52
BT1	27	01

121HB

PIN NAME	TEST POINT	
	A	B
A(0)	17	43
A(1)	18	44
A(2)	36	10
A(3)	35	09
CX	15	41
F1(0)	22	48
F1(1)	23	49
F1(2)	29	03
F1(3)	32	06
F2(0)	21	47
F2(1)	24	50
F2(2)	30	04
F2(3)	31	05
T1(0)	20	46
T1(1)	25	51
T1(2)	27	01
T1(3)	34	08
T2(0)	19	45
T2(1)	26	52
T2(2)	28	02
T2(3)	33	07

121HC

PIN NAME	TEST POINT	
	A	B
AR(0)	23	49
AR(1)	24	50
AR(2)	21	47
AR(3)	22	48
AW(0)	18	44
AW(1)	17	43
AW(2)	20	46
AW(3)	19	45
CS(0)	33	07
CS(1)	34	08
DI(0)	32	06
DI(1)	31	05
DI(2)	30	04
DI(3)	29	03
MR	15	41
WE0	35	09
WE1	36	10
DO(0)	26	52
DO(1)	25	51
DO(2)	27	01
DO(3)	28	02

121HD

PIN NAME	TEST POINT	
	A	B
A(0)	27	01
A(1)	28	02
A(2)	29	03
A(3)	30	04
A(4)	18	44
A(5)	17	43
A(6)	20	46
A(7)	19	45
DI	21	47
S(0)	32	06
S(1)	35	09
S(2)	36	10
W	26	52
DO	25	51

121HF

PIN NAME	TEST POINT	
	A	B
A(0)	19	45
A(1)	20	46
A(2)	31	05
B(0)	22	48
B(1)	36	10
B(2)	32	06
C(0)	21	47
C(1)	15	41
C(2)	33	07
D(0)	24	50
D(1)	18	44
D(2)	34	08
E(0)	23	49
E(1)	17	43
E(2)	35	09
F(0)	25	51
F(1)	28	02
F(2)	29	03
T(0)	26	52
T(1)	27	01
T(2)	30	04

Test Point Charts for LSI Arrays (Sheet 1 of 3)

12CA

PIN NAME	TEST POINT
A(0)	11
A(1)	09
A(2)	06
A(3)	01
A(4)	45
A(5)	49
A(6)	48
A(7)	41
APAR	35
B(0)	10
B(1)	05
B(2)	07
B(3)	08
B(4)	44
B(5)	43
B(6)	46
B(7)	42
BPAR	34
C(0)	17
C(1)	20
C(2)	15
CARYN	38
CODE(0)	16
CODE(1)	12
CRYTST	18
ECAROR	03
EXEROR	47
NEXT18	37
NEXT60	36
NFCAR	19
ALZERO	28
CARROR	02
D	21
DARROR	50
GPAR	04
ND	22
NENA	51
NGEN	52
NSGN18	32
NSUM	23
SUM(0)	24
SUM(1)	26
SUM(2)	25
SUM(3)	27
SUM(4)	29
SUM(5)	30
SUM(6)	31
SUM(7)	33

12CB

PIN NAME	TEST POINT
A(0)	34
A(1)	36
A(2)	37
A(3)	42
A(4)	20
A(5)	18
A(6)	21
A(7)	12
B(0)	35
B(1)	33
B(2)	38
B(3)	41
B(4)	17
B(5)	15
B(6)	24
B(7)	11
C(0)	32
C(1)	31
C(2)	44
C(3)	45
C(4)	27
C(5)	25
C(6)	19
C(7)	10
CLCK	03
CLCKEN	06
D(0)	48
D(1)	47
D(2)	46
D(3)	43
D(4)	23
D(5)	16
D(6)	22
D(7)	02
LATCH	09
S(0)	08
S(1)	07
S(2)	52
P	51
Z(0)	30
Z(1)	49
Z(2)	29
Z(3)	50
Z(4)	28
Z(5)	04
Z(6)	26
Z(7)	05
Z(8)	01

12CC

PIN NAME	TEST POINT
DATIN(0)	43
DATIN(1)	41
DATIN(2)	02
DATIN(3)	06
DATIN(4)	10
DATIN(5)	12
DATIN(6)	11
DATIN(7)	16
FAULT	17
FCODE(0)	08
FCODE(1)	20
MUX(0)	21
MUX(1)	18
PARIN	09
SCNTA(0)	27
SCNTA(1)	24
SCNTA(2)	23
SCNTB(0)	34
SCNTB(1)	19
SCNTB(2)	26
SCNTC(0)	35
SCNTC(1)	22
SCNTC(2)	25
SDATIN(1)	32
SDATIN(2)	37
SDATIN(3)	46
SDATIN(4)	42
SDATIN(5)	44
SDATIN(6)	36
SDATIN(7)	38
SIGN	15
DATOT(0)	30
DATOT(1)	52
DATOT(2)	45
DATOT(3)	49
DATOT(4)	33
DATOT(5)	01
DATOT(6)	04
DATOT(7)	05
NDATOT(0)	29
NDATOT(1)	50
NDATOT(2)	48
NDATOT(3)	47
NDATOT(4)	31
NDATOT(5)	51
NDATOT(6)	03
NDATOT(7)	07
PAROT	28

12CD

PIN NAME	TEST POINT
A(0)	45
A(1)	42
A(2)	38
A(3)	35
A(4)	20
A(5)	18
A(6)	16
A(7)	11
B(0)	44
B(1)	34
B(2)	37
B(3)	32
B(4)	17
B(5)	01
B(6)	09
B(7)	06
CINA	36
CINB	19
CINC	12
CIND	28
CLCK	03
CZERO	22
DECR	33
DUAL	08
EN	07
NTST	02
PARA	48
PARB	43
PM1L	10
PM2	41
PM4	46
PM8O1U	52
SEL(0)	30
SEL(1)	15
BEQR	51
BEQRL	47
BGTR	49
BGTRL	50
COUT	27
PARZ	29
Z(0)	31
Z(1)	26
Z(2)	23
Z(3)	25
Z(4)	24
Z(5)	21
Z(6)	05
Z(7)	04

12CE

PIN NAME	TEST POINT
A(0)	45
A(1)	46
A(2)	44
A(3)	43
A(4)	34
A(5)	33
A(6)	35
A(7)	36
B(0)	12
B(1)	08
B(2)	41
B(3)	09
B(4)	17
B(5)	15
B(6)	20
B(7)	37
CLCK	03
PA	10
PB	18
V19	42
V20	38
V21	11
V22	19
V23	16
C(0)	49
C(1)	50
C(2)	47
C(3)	48
C(4)	29
C(5)	30
C(6)	31
C(7)	32
D(0)	07
D(1)	06
D(2)	05
D(3)	04
D(4)	22
D(5)	21
D(6)	24
D(7)	23
PC	51
PD	25
V25	27
V26	52
V27	28
V37	01
V38	02
V39	26

12CF

PIN NAME	REAL PIN
A(0)	37
A(1)	52
AC(0)	33
AC(1)	46
ALN(0)	38
ALN(1)	43
B(0)	36
B(1)	15
C(0)	41
C(1)	48
CLCK	03
D(0)	42
D(1)	44
DAIG(0)	28
DAIG(1)	27
DEMUXG(0)	10
DEMUXG(1)	08
DSS(0)	16
DSS(1)	11
FZERO	20
GFU	12
HOLD	18
LM(0)	32
LM(1)	45
MODE	34
PH3	09
RELOAD	35
RF(0)	17
RF(1)	06
T	07
E(0)	19
E(1)	22
F(0)	30
F(1)	31
G(0)	51
G(1)	04
H(0)	01
H(1)	02
I(0)	50
I(1)	49
J(0)	23
J(1)	21
K(0)	25
K(1)	29
L(0)	26
L(1)	24
U	05
X	47

12CG

PIN NAME	TEST POINT
A(0)	29
A(1)	28
A(2)	23
A(3)	11
AP	06
B(0)	42
B(1)	36
B(2)	19
B(3)	10
BP	41
BRIN	38
CLCK	03
COMP	20
ENA	50
ENB	07
ENBA	08
END	51
NEN(0)	33
NEN(1)	34
NEN(2)	46
NEN(3)	44
NEN(4)	17
NEN(5)	15
NEN(6)	12
NGR(0)	32
NGR(1)	35
NGR(2)	48
NGR(3)	43
NGR(4)	22
NGR(5)	18
NGR(6)	16
NW(0)	37
NW(1)	09
PI	45
SPECAD	02
S2S	25
BOUT	31
INC	49
NEO(1)	21
NEO(2)	24
NGO(1)	27
NGO(2)	26
PO	30
PS	47
S(0)	52
S(1)	01
S(2)	04
S(3)	05

12CH

PIN NAME	REAL PIN
CHSEL	37
CODE(0)	48
CODE(1)	43
CODE(2)	46
ENPLUS	45
NE(0)	18
NE(1)	17
NE(2)	20
NE(3)	21
NE(4)	23
NE(5)	16
NE(6)	11
NE(7)	12
NE(8)	42
NE(9)	08
NE(10)	03
NE(11)	06
NE(12)	01
NG(0)	15
NG(1)	19
NG(2)	34
NG(3)	22
NG(4)	32
NG(5)	38
NG(6)	36
NG(7)	10
NG(8)	52
NG(9)	09
NG(10)	44
NG(11)	07
NG(12)	05
NSGN18	51
NS32	31
NS64	33
PLUS1	47
SIGNA	41
SIGNB	35
C(0)	25
C(1)	26
C(3)	24
C(5)	02
C(7)	50
C(9)	49
C(11)	04
NGENA	29
NX1860	30
OVFSIN(0)	27
OVFSIN(1)	28

Test Point Charts for LSI Arrays (Sheet 2 of 3)

12CI

PIN NAME	TEST POINT
AG4I	38
CI	09
CJCI	08
CLCK	03
CLFC	02
CLKEN	01
DNF(0)	19
DNF(1)	22
DNF(2)	16
DNF(3)	24
DNI(0)	33
DNI(1)	32
DNI(2)	42
DNI(3)	36
DNSI	43
DSI(0)	20
DSI(1)	25
DSI(2)	18
DSI(3)	10
DVSSI	26
EDNFI	07
EDVSI	15
QCNT(0)	34
QCNT(1)	37
QSI	44
RI(0)	17
RI(1)	28
RI(2)	12
RI(3)	11
SG4I	41
TOCEI	35
TOCP1I	46
XBSGN	45
AG4O	21
CO	30
GG	29
GP	27
N2CEO	48
QO(0)	51
QO(1)	52
QO(2)	50
QO(3)	49
RO(0)	31
RO(1)	04
RO(2)	05
RO(3)	06
SG4O	23
TOCEO	47

12CJ

PIN NAME	TEST POINT
ANCI	07
CLCK	03
CLCKEN	01
CLFC	51
EI(0)	41
EI(1)	30
EI(2)	44
EI(3)	48
EI(4)	42
EI(5)	43
EI(6)	46
EI(7)	45
EI(8)	16
EI(9)	11
EI(10)	17
EI(11)	09
EI(12)	12
EI(13)	08
EI(14)	10
NDIV	25
NFC	49
NGI(0)	50
NGI(1)	35
NGI(2)	32
NGI(3)	36
NGI(4)	33
NGI(5)	38
NGI(6)	34
NGI(7)	37
NGI(8)	19
NGI(9)	18
NGI(10)	22
NGI(11)	29
NGI(12)	23
NGI(13)	20
NGI(14)	27
NGI(15)	15
SNCI	05
SNRCI	06
AJPSS	24
AKPSS	21
COT(0)	47
COT(1)	02
COT(2)	52
COT(3)	31
COT(4)	26
COT(5)	28
SNRCO	04

12CK

PIN NAME	TEST POINT
CNTL(0)	30
CNTL(1)	35
CNTL(2)	42
FAOF	41
G0COD(0)	17
G0COD(1)	22
G0COD(2)	28
G0COD(3)	32
G1COD(0)	18
G1COD(1)	19
G1COD(2)	31
G1COD(3)	34
G2COD(0)	06
G2COD(1)	08
G2COD(2)	09
G2COD(3)	02
G3COD(0)	20
G3COD(1)	07
G3COD(2)	10
G3COD(3)	33
MDOF	38
N(0)	23
N(1)	27
N(2)	15
N(3)	16
N(4)	12
N(5)	11
N(6)	50
N(7)	01
N(8)	52
N(9)	45
N(10)	48
N(11)	44
N(12)	47
N(13)	43
N(14)	46
N(15)	37
N(16)	36
RANK2	29
DATA	51
GXCOD(0)	04
GXCOD(1)	05
GXCOD(2)	03
GXCOD(3)	49
SCNT(0)	21
SCNT(1)	24
SCNT(2)	26
SCNT(3)	25

12CL

PIN NAME	TEST POINT
A(0)	23
A(1)	26
A(2)	15
AC(0)	33
AC(1)	32
AS	36
B(0)	41
B(1)	12
B(2)	09
BS	38
C(0)	16
C(1)	11
C(2)	05
CI	01
CON(0)	22
CON(1)	19
CON(2)	20
CS	03
CU(0)	10
CU(1)	08
CU(2)	52
EC(0)	48
EC(1)	43
EXPN	46
INV	49
MC(0)	18
MC(1)	17
MC(2)	07
MC(3)	06
OC(0)	44
OC(1)	50
PC(0)	42
PC(1)	37
UBC(0)	35
UBC(1)	34
ER1	04
ER1F	02
ER2	47
ER2F	51
GG	25
GT	24
NR	28
NRF	29
OUF170	45
R(0)	27
R(1)	21
R(2)	30
RF	31

12CM

NAME	TEST POINT
AGB	36
AGI1	08
AGI2	07
CMPCOD(0)	26
CMPCOD(1)	27
CMPCOD(2)	25
MUXCOD(0)	32
MUXCOD(1)	33
MUXCOD(2)	34
MUXCOD(3)	35
RNDSGN	10
ROUND	09
SFTRND	03
SK6	28
X(0)	46
X(1)	20
X(2)	17
X(3)	19
X(4)	16
X(5)	38
X(6)	42
X(7)	44
XP	45
XSGN1	11
Y(0)	49
Y(1)	18
Y(2)	12
Y(3)	22
Y(4)	15
Y(5)	37
Y(6)	41
Y(7)	43
YP	48
YSGN1	02
YSGN2	51
YSGN3	01
AGO	05
NAGO	06
Z(0)	52
Z(1)	21
Z(2)	24
Z(3)	23
Z(4)	29
Z(5)	30
Z(6)	31
Z(7)	50
ZP	47
ZS	04

12CN

PIN NAME	TEST POINT
A(0)	15
A(1)	41
A(2)	10
A(3)	12
AP	18
B(0)	35
B(1)	16
B(2)	11
B(3)	09
BP	36
CLCK	03
COMPL	48
DEC	45
ENA	08
ENB	07
ENC	43
FENA	51
FENB	52
FI(0)	22
FI(1)	20
FI(2)	17
FI(3)	24
FI(4)	33
FI(5)	34
FI(6)	29
FI(7)	23
FI(8)	27
INHCIN	42
LDA	06
LDB	44
NCIN	37
NENIN	32
NLATCH	46
NPLUS1	38
C(0)	04
C(1)	30
C(2)	31
C(3)	50
CEQZ	47
COUT1	49
CP	05
FO(0)	19
FO(1)	21
FO(2)	26
FO(3)	25
NCOUT	28
NCP	02
NENOUT	01

12CP

PIN NAME	TEST POINT
A(0)	17
A(1)	18
A(2)	25
A(3)	08
A(4)	09
A(5)	19
A(6)	20
A(7)	51
AC	31
B(0)	21
B(1)	10
B(2)	11
CLCK	03
D	12
H(0)	46
H(1)	48
H(2)	44
H(3)	45
J(0)	28
J(1)	36
J(2)	32
J(3)	35
L	02
M(0)	41
M(1)	38
M(2)	34
MDA	16
MDB	22
N	33
PA	15
S(0)	37
S(1)	42
ZERO	43
C(0)	26
C(1)	27
C(2)	29
C(3)	30
C(4)	04
C(5)	49
C(6)	52
C(7)	01
E	06
F	05
G	07
I	47
K	23
O	50
P	24

12CQ

PIN NAME	TEST POINT
CLCK	03
CLFC	04
FANEN	47
FNO	30
MCA(0)	49
MCA(1)	18
MCA(2)	07
MCA(3)	16
MCA(4)	52
MCA(5)	44
MCA(6)	09
MCA(7)	06
MCA(8)	05
MDIA(0)	38
MDIA(1)	17
MDIA(2)	34
MDIB(0)	43
MDIB(1)	36
MDIB(2)	42
MDIC(0)	12
MDIC(1)	11
MDIC(2)	15
MPL(0)	41
MPL(1)	48
MPL(2)	45
ONECMP	46
SNMCA	37
SNMPL	35
ZERO(0)	08
ZERO(1)	10
DO0(0)	32
DO0(1)	27
DO0(2)	19
DO1(0)	33
DO1(1)	29
DO1(2)	23
MPC(0)	22
MPC(1)	21
MPC(2)	01
MPC(3)	51
MPS(0)	20
MPS(1)	26
MPS(2)	02
MPS(3)	50
NDO(0)	31
NDO(1)	25
NDO(2)	24
TWOCOR	28

Test Point Charts for LSI Arrays (Sheet 3 of 3)

12CR

PIN NAME	TEST POINT
CLCK	03
CORR(0)	06
CORR(1)	08
CORR(2)	44
CORR(3)	48
CRIN(0)	11
CRIN(1)	45
CRIN(2)	43
ENAB	41
ENAX	35
ENBX	38
ENCI2	46
ENCK	07
MPC1A(0)	20
MPC1A(1)	26
MPC1A(2)	30
MPC1A(3)	34
MPC1B(0)	18
MPC1B(1)	22
MPC1B(2)	27
MPC1B(3)	33
MPC2(0)	09
MPC2(1)	10
MPC2(2)	52
MPC2(3)	42
MPS1A(0)	17
MPS1A(1)	24
MPS1A(2)	25
MPS1A(3)	32
MPS1B(0)	19
MPS1B(1)	23
MPS1B(2)	28
MPS1B(3)	36
MPS2(0)	16
MPS2(1)	12
MPS2(2)	15
MPS2(3)	37
CROT(0)	21
CROT(1)	05
CROT(2)	04
PC(0)	02
PC(1)	51
PC(2)	49
PC(3)	47
PS(0)	01
PS(1)	29
PS(2)	50
PS(3)	31

12CS

PIN NAME	TEST POINT
A(0)	34
A(1)	36
A(2)	37
A(3)	42
A(4)	20
A(5)	18
A(6)	21
A(7)	12
B(0)	35
B(1)	33
B(2)	38
B(3)	41
B(4)	17
B(5)	15
B(6)	24
B(7)	11
C(0)	32
C(1)	31
C(2)	44
C(3)	45
C(4)	27
C(5)	25
C(6)	19
C(7)	10
CLCK	03
CLCKEN	06
D(0)	48
D(1)	47
D(2)	46
D(3)	43
D(4)	23
D(5)	16
D(6)	22
D(7)	02
LATCH	09
S(0)	08
S(1)	07
S(2)	52
P	51
Z(0)	30
Z(1)	49
Z(2)	29
Z(3)	50
Z(4)	28
Z(5)	04
Z(6)	26
Z(7)	05
Z(8)	01

12CT

PIN NAME	TEST POINT
A(0)	34
A(1)	36
A(2)	37
A(3)	42
A(4)	20
A(5)	18
A(6)	21
A(7)	12
B(0)	35
B(1)	33
B(2)	38
B(3)	41
B(4)	17
B(5)	15
B(6)	24
B(7)	11
C(0)	32
C(1)	31
C(2)	44
C(3)	45
C(4)	27
C(5)	25
C(6)	19
C(7)	10
CLCK	03
CLCKEN	06
D(0)	48
D(1)	47
D(2)	46
D(3)	43
D(4)	23
D(5)	16
D(6)	22
D(7)	02
LATCH	09
S(0)	08
S(1)	07
S(2)	52
P	51
Z(0)	30
Z(1)	49
Z(2)	29
Z(3)	50
Z(4)	28
Z(5)	04
Z(6)	26
Z(7)	05
Z(8)	01

12CU

PIN NAME	TEST POINT
A(0)	45
A(1)	46
A(2)	44
A(3)	43
A(4)	34
A(5)	33
A(6)	35
A(7)	36
B(0)	12
B(1)	08
B(2)	41
B(3)	09
B(4)	17
B(5)	15
B(6)	20
B(7)	37
CLCK	03
PA	10
PB	18
V19	42
V20	38
V21	11
V22	19
V23	16
C(0)	49
C(1)	50
C(2)	47
C(3)	48
C(4)	29
C(5)	30
C(6)	31
C(7)	32
D(0)	07
D(1)	06
D(2)	05
D(3)	04
D(4)	22
D(5)	21
D(6)	24
D(7)	23
PC	51
PD	25
V25	27
V26	52
V27	28
V37	01
V38	02
V39	26

12SC

PIN NAME	TEST POINT
CARRY	16
IN(0)	20
IN(1)	32
IN(2)	35
IN(3)	38
IN(4)	43
IN(5)	46
IN(6)	45
IN(7)	44
IN(8)	42
IN(9)	41
IN(10)	37
IN(11)	36
IN(12)	31
IN(13)	29
IN(14)	27
IN(15)	01
IN(16)	49
IN(17)	25
IN(18)	19
SH(0)	12
SH(1)	11
SH(2)	34
V20	07
V21	23
V22	22
V23	33
V24	17
V25	48
V27	08
V28	09
V29	15
V30	21
V31	18
V32	52
V47	10
OUT(0)	06
OUT(1)	05
OUT(2)	04
OUT(3)	02
OUT(4)	03
OUT(5)	47
OUT(6)	51
OUT(7)	26
OUT(8)	24
OUT(9)	28
OUT(10)	30
OUT(11)	50

12SD

PIN NAME	TEST POINT
A(0)	07
A(1)	09
A(2)	11
A(3)	18
A(4)	20
A(5)	45
B(0)	44
B(1)	08
B(2)	10
B(3)	16
B(4)	17
B(5)	19
C(0)	46
C(1)	42
C(2)	37
C(3)	35
C(4)	34
C(5)	33
CLCK	03
D(0)	48
D(1)	43
D(2)	41
D(3)	38
D(4)	36
D(5)	32
F(0)	26
F(1)	15
F(2)	12
F(3)	02
F(4)	27
R	51
S	49
DFLAG	47
M(1)	25
M(2)	28
M(3)	23
Y(0)	52
Y(1)	50
Y(2)	01
Y(3)	30
Y(4)	31
Y(5)	29
Z(0)	04
Z(1)	05
Z(2)	06
Z(3)	24
Z(4)	21
Z(5)	22

12SG

PIN NAME	TEST POINT
A(0)	41
A(1)	37
A(2)	09
A(3)	20
B(0)	44
B(1)	38
B(2)	10
B(3)	15
C(0)	46
C(1)	36
C(2)	11
C(3)	18
CLCK	03
D(0)	43
D(1)	42
D(2)	08
D(3)	17
F	16
S(0)	33
S(1)	34
S(2)	21
S(3)	19
S(4)	07
S(5)	01
S(6)	22
S(7)	45
S(8)	29
S(9)	35
S(10)	12
V(0)	48
V(1)	51
V(2)	32
V(3)	26
W(0)	47
W(1)	52
W(2)	31
X(0)	50
X(1)	02
X(2)	30
X(3)	24
Y(0)	49
Y(1)	04
Y(2)	28
Y(3)	23
Z(0)	06
Z(1)	05
Z(2)	27
Z(3)	25

12SI

PIN NAME	TEST POINT
CLCK	03
V01	12
V02	16
V03	10
V04	09
V05	22
V06	20
V07	18
V08	15
V09	35
V10	11
V11	42
V12	19
V13	07
V14	41
V15	46
V16	37
V17	38
V18	08
V20	17
V21	34
V22	43
V23	33
V24	45
V25	48
V26	44
V27	36
V28	32
X(0)	04
X(1)	26
X(2)	52
X(3)	27
X(4)	01
X(5)	21
X(6)	47
X(7)	30
Y(0)	05
Y(1)	25
Y(2)	51
Y(3)	28
Y(4)	02
Y(5)	24
Y(6)	50
Y(7)	31
Z(0)	06
Z(1)	23
Z(2)	49
Z(3)	29

CMC TEST POINTS

Tables 2-5 through 2-8 contain test points and bit distributions for the CMC paks that provide the ports/distributor in and ports/distributor out functions.

Table 2-5. Data Bits to Write ECC Generator

Pak Location in ZIF Cage A1	N TP18	N+8 TP08	N+16 TP13	N+24 TP20	N+32 TP17	N+40 TP01	N+48 TP03	N+56 TP02
E	0	8	16	24	32	40	48	56
F	1	9	17	25	33	41	49	57
G	2	10	18	26	34	42	50	58
H	3	11	19	27	35	43	51	59
L	4	12	20	28	36	44	52	60
M	5	13	21	29	37	45	53	61
N	6	14	22	30	38	46	54	62
P	7	15	23	31	39	47	55	63
R	P_{D0}	P_{D1}	P_{D2}	P_{D3}	P_{D4}	P_{D5}	P_{D6}	P_{D7}

Table 2-6. Address Bits to Maintenance Registers and CM, Control Bits to Control/Delay and Maintenance Register

Pak Location in ZIF Cage A1	Address Bits				Control Bits		
	N TP22	N+8 TP21	N+16 TP25	N+24 TP24	Mark N TP43	Tag N TP23	Function N TP26
E	0	8	16	24	0	0	0
F	1	9	17	25	1	1	1
G	2	10	18	26	2	2	2
H	3	11	19	27	3	3	3
L	4	12	20	28	4	4	4
M	5	13	21	–	5	5	5
N	6	14	22	–	6	6	6
P	7	15	23	–	7	7	7
R	P_{A0}	P_{A1}	P_{A2}	P_{A3}	P_M	P_T	P_F

Table 2-7. Data, Tag, and Response Code Bits to CP, IOU, and AUX Ports

Pak Location in ZIF Cage C1	Data N TP17	Data N+8 TP16	Data N+16 TP15	Data N+24 TP14	Data N+32 TP13	Data N+40 TP19	Data N+48 TP21	Data N+56 TP20	Tag N TP18	Resp Code N TP22
G	0	8	16	24	32	40	48	56	0	0
H	1	9	17	25	33	41	49	57	1	1
J	2	10	18	26	34	42	50	58	2	2
K	3	11	19	27	35	43	51	59	3	-
M	4	12	20	28	36	44	52	60	4	-
N	5	13	21	29	37	45	53	61	5	-
P	6	14	22	30	38	46	54	62	6	-
R	7	15	23	31	39	47	55	63	7	-
S	P_{D0}	P_{D1}	P_{D2}	P_{D3}	P_{D4}	P_{D5}	P_{D6}	P_{D7}	P_T	P_R

Table 2-8. Local CP Data, Tag, and Response Code Bits

Pak Location in ZIF Cage C1	Data N TP35	Data N+8 TP36	Data N+16 TP41	Data N+24 TP34	Data N+32 TP37	Data N+40 TP38	Data N+48 TP42	Data N+56 TP40	Tag N -	Resp Code N TP39
G	0	8	16	24	32	40	48	56	0	0
H	1	9	17	25	33	41	49	57	1	1
J	2	10	18	26	34	42	50	58	2	2
K	3	11	19	27	35	43	51	59	3	-
M	4	12	20	28	36	44	52	60	4	-
N	5	13	21	29	37	45	53	61	5	-
P	6	14	22	30	38	46	54	62	6	-
R	7	15	23	31	39	47	55	63	7	-
S	P_{D0}	P_{D1}	P_{D2}	P_{D3}	P_{D4}	P_{D5}	P_{D6}	P_{D7}	P_T	P_R

SOFT CONTROL MEMORY MAPS

Figures 2-2 through 2-4 provide references for the contents of the arithmetic logic network (ALN) and address control (AC) soft control memory maps following an initialization with the product set microcode. Figure 2-5 provides the contents of the AC pseudo soft control.

BUSINESS DATA PROCESSOR RANDOM ACCESS MEMORIES

Figures 2-6 through 2-9 provide references for the contents of the business data processor (BDP) random access memories (RAM) following initialization with the product set microcode.

	RAM LOC$_{16}$	µ BIT 55=0 SOFT CONTROL DATA OUTPUT BITS																µBITS 56-59=	µ BIT 55=1 SOFT CONTROL DATA OUTPUT BITS																
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
START C170 C180 SINGLE, DOUBLE PRECISION FLOATING POINT MULTIPLY; C170 48-BIT ROUND MULTIPLY	0	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	MULTIPLY/DIVIDE IDLE
	1	1	1	0	1	1	0	1	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	2	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
RUN C170 C180 SINGLE, DOUBLE PRECISION FLOATING POINT MULTIPLY	4	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	SELECT HIGH-ORDER 64 BITS OF 128-BIT RESULT-C180 64-BIT INTEGER MULTIPLY
	5	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	
	6	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	
	7	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	
END C180 32-64-BIT INTEGER MULTIPLY; C170, C180 DOUBLE PRECISION FLOATING POINT MULTIPLY △1	8	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	END C170 POP COUNT
	9	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	
	A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
	B	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
RUN C170 48-BIT ROUND MULTIPLY	C	1	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	SELECT HIGH-ORDER 8 BITS OF 72-BIT RESULT-C180 64X8 BIT MULTIPLY
	D	1	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	
	E	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	
	F	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	
START C180 32-BIT INTEGER MULTIPLY	10	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0	4	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	SELECT LOW-ORDER 48 BITS OF MULTIPLY RESULT AND CLEAR MULTIPLY REGISTERS (NOT USED)
	11	1	1	0	1	1	0	1	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	
	12	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	
	13	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	
RUN C180 32-BIT INTEGER MULTIPLY	14	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	5	0	1	1	1	0	0	0	1	1	0	0	0	1	0	0	0	START 64X64 BIT UNSIGNED MULTIPLY (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL MULTIPLY/DIVIDE)
	15	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		1	1	0	1	1	0	1	1	0	0	0	0	1	0	0	0	
	16	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0	
	17	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0	
START C180 64-BIT INTEGER MULTIPLY	18	0	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0	6	0	1	1	1	1	0	0	1	0	0	1	0	0	0	0	0	LOAD B OPERAND INTO DIVIDEND REGISTER (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL DIVIDE)
	19	1	1	0	1	1	0	1	1	0	0	0	0	1	0	0	0		0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0	
	1A	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	
	1B	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	
RUN C180 64-BIT INTEGER MULTIPLY	1C	1	1	0	1	1	0	0	1	0	0	1	0	1	0	0	0	7	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	LEFT SHIFT DIVIDEND REGISTER (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL DIVIDE)
	1D	1	1	0	1	1	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	
	1E	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	
	1F	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	
START C170 FLOATING POINT, FLOATING POINT ROUND, C180 FLOATING POINT DIVIDE	20	0	1	1	1	1	0	0	1	0	0	1	0	0	0	0	0	8	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	START DIVIDE DIVIDEND RGTR/C OPERAND (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL DIVIDE)
	21	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	
	22	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	
	23	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	
RUN DIVIDE, C170 POP COUNT	24	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	9	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	RUN DIVIDE (ADDRESS 18 ABOVE) (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL DIVIDE)
	25	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	26	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	27	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
END DIVIDE	28	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	A	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	READ 4 HIGH ORDER RESULT BITS-64X64 BIT UNSIGNED MULTIPLY (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, (C180 BDP DECIMAL DIVIDE)
	29	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	
	2A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
	2B	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
START C180 INTEGER DIVIDE	2C	0	1	1	1	1	0	0	1	0	0	1	0	0	0	0	0	B	0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	END LEFT SHIFT DIVIDEND REGISTER (ADDRESS 17) (C180 DOUBLE PRECISION FLOATING POINT DIVIDE, C180 BDP DECIMAL DIVIDE)
	2D	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	
	2E	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	1	1	0	0	0	0	0	
	2F	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0		0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	
END C180 BDP CONVERT DECIMAL TO BINARY	30	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	31	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	32	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	33	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
START C180 BDP CONVERT DECIMAL TO BINARY	34	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	35	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	36	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	37	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
END C170, C180 SINGLE PRECISION, C180 DOUBLE PRECISION FLOATING POINT MULTIPLY; C170 48-BIT ROUND MULTIPLY △1	38	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	39	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3A	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3B	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
START C170 POP COUNT	3C	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3D	0	1	0	1	0	0	1	1	0	0	1	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3E	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	3F	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RAM LOC$_{16}$	µ BIT 55=0 SOFT CONTROL DATA OUTPUT BITS																µBITS 56-59=	µ BIT 55=1 SOFT CONTROL DATA OUTPUT BITS																
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	

SOFT CONTROL DATA OUTPUT BITS

BIT	DESCRIPTION
0	ENABLE ITERATION RESULT TO C REGISTER
1	LOAD C REGISTER
2	ENABLE DIVIDEND TO DIVIDEND REGISTER
3	LOAD PARTIAL SUMMING NETWORK, CARRY REGISTERS; ENABLE DIVIDEND TO QUOTIENT REGISTER
4	ENABLE PARTIAL SUMMING NETWORK FEEDBACK PATH; ENABLE RUN DIVIDE
5	ENABLE POP COUNTER INCREMENT
6	ENABLE C REGISTER PARITY CHECK
7	LOAD NEW SOFT CONTROL WORD
8	SELECT REMAINDER REGISTER LEAST SIGNIFICANT BIT INPUT
9	DIVIDE ROUND BIT
10	ENABLE DIVIDE AND POP COUNT CLOCKS
11-13	MULTIPLY/DIVIDE OUTPUT MUX CONTROL CODE
14,15	NOT USED

NOTES

△1 IN CONJUNCTION WITH OTHER µCODE BITS. SOFT CONTROL ENTRY ADDRESS 0E SELECTS HIGH ORDER 48 BITS OF RESULT. ADDRESS 02 SELECTS LOW ORDER 48 BITS. WHEN µCODE BITS SELECT 64X64 BIT UNSIGNED MULTIPLY, ADDRESS 02 SELECTS LOW-ORDER 64 BITS AND ADDRESS 0E SELECTS BIT $2^{60} \rightarrow 2^{123}$.

Figure 2-2. ALN Soft Control Memory Map

AC OPERATION	OPCODE (16)	ADRS (8)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
LD/STORE WORD	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
		1	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
		2	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
		3	0	0	0	0	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
LD BYTES	1	4	1	0	0	0	0	1	0	0	0		0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	1	0
		5	0	0	0	1	1	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1
		6	0	1	0	0	0	0	0	0	0		0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0
		7	0	1	0	0	0	0	0	0	0		1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1
STORE BIT, TEST AND SET BIT	2	10	1	0	0	0	0	1	0	0	0		0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	1	0
		11	1	0	0	1	0	1	1	0	0		1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1	0	1
		12	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1	0	0
		13	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1
STORE BYTES	3	14	1	0	0	0	0	1	0	0	0		0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0
		15	0	0	0	0	1	1	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1
		16	0	1	0	0	0	1	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0
		17	0	1	0	0	0	1	0	0	0		0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	0
LD BIT	4	20	0	0	0	0	0	0	0	0	0		0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	0
		21	0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1
		22	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0
		23	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
NO OPN	5	24	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0
		25	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1
		26	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1
		27																																
BDP RIGHT TO LEFT	6	30	1	0	0	0	0	1	0	0	0		0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	0
		31	0	0	0	1	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	1	0	1
		32	1	1	0	0	0	0	0	0	0		0	1	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0
		33	0	1	0	0	0	0	0	0	0		0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
BDP LEFT TO RIGHT	7	34	1	0	0	0	0	1	0	0	0		0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0
		35	0	0	0	1	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	1
		36	0	0	0	0	0	0	0	0	0		0	1	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0
		37	0	0	0	0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
BDP PREVALIDATE STORE	8	40	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	1	0
		41	0	0	0	0	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1
		42	0	1	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0
		43	0	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
		44																																
		45																																
		46																																
		47																																
LD/STORE MULTIPLE PREVALIDATION	A	50	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0
		51	1	0	0	0	0	1	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1
		52	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0
		53	1	0	0	0	0	1	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1
		54	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	1	0
		55	1	0	1	0	1	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1
		56	1	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
		57	0	1	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1
		60																																
		61																																
		62																																
		63																																
BDP LD BIN DATA	D	64	1	0	0	0	0	1	0	0	0		0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0
		65	0	0	0	0	0	1	1	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1
		66	0	0	0	1	0	0	1	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0
		67	0	0	0	0	0	0	1	0	0		0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0
STORE BIT, TEST AND SET BIT (CONT)		70	1	0	0	0	0	1	1	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0
		71	1	0	0	0	1	1	1	0	0		0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	1
		72	1	0	0	0	0	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		73	1	0	0	0	0	1	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
STORE BIT, TEST AND SET BIT, STORE BYTES, BDP R→L, BDP L→R (CONT)		74	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
		75	0	0	0	0	1	0	0	0	0		0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1
		76	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		77	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
			SOFT CONTROL 1 OUTPUT BITS																															

AC SOFT CONTROL 1 MEMORY MAP (CYCLE 40 MICROCODE)

BIT	DESCRIPTION
0	ENBL FEEDBACK PATH TO ADRS ADDER INP A
1	LD A/C AND B STR ADRS CNTRS
2	ENBL LD/STORE MULTIPLE LENGTH TO ADRS ADDER
3	LD A/C STR LENGTH CNTR; ENBL BDP A/C STR NO OPN
4	ENBL A/C STR MEM REQ
5	BLOCK A/B OP TO ADRS ADDER INP B
6	ENBL SC 2 ADRS CHANGE
7	NOT USED
8	ENBL INP TO LD/STORE MULTIPLE LENGTH ADDER
9	NOT USED
10	LD BYTE SHIFT CNTR
11	ENBL DECR A/C STR LENGTH CNTR
12	ENBL READ SC 2
13	LD A/C STR DISASSY/ASSY CNTR
14	LD FINAL A/C STR BN RGTR; ENBL SET C STR OPN FF
15	ENBL ADRS ADDER TO MARK BIT GEN
16	COMP BYTE SHIFT CNT
17	ENBL SET A STR END FF
18	ENBL READ SC 1 DURING AC NO OPN
19	ENBL SET TEST ADRS FF
20	SEND LD AJ DESCR SIGNAL TO BDP
21	SEND AC RESPONSE SIGNAL TO ICP AND LM
22	DECR BIT RIGHT SHIFT CNTR
23	HOLD AC A STR BUSY
24	ENBL SET PAGE BOUNDARY FF
25	LD BIT RIGHT SHIFT CNTR
26-31	COMP OF NEXT SC 1 ADRS

Figure 2-3. AC Soft Control 1 Memory Map

AC OPERATION	OPCODE (16)	ADRS (8)	SOFT CONTROL 2 OUTPUT BITS																													
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
LD/STORE WORD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
		1																																
		2																																
		3																																
LOAD BYTES	1	4	1	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	0	1	0
		5	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	1	1	0	0	1
		6	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0
		7	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
STORE BIT, TEST AND SET BIT	2	10	1	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	1	0	1	1	0
		11	1	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1	0	1
		12	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0	0
		13	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	1
STORE BYTES	3	14	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1	0	0	1	0
		15	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1
		16	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
		17	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
LOAD BITS	4	20	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	1	1	1	0
		21	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	1	0	1
		22	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1
		23																																
		24																																
		25																																
		26																																
		27																																
BDP LD RIGHT TO LEFT	6	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	1	1	0
		31	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1
		32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	1
		33																																
BDP LD LEFT TO RIGHT	7	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	0	1	0
		35	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1
		36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1
		37																																
STORE BIT, TEST AND SET BIT (CONT)		40	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0	1	1	1	1	0
		41	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	0	1
		42	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	1	0	0
		43	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	1	1	0	1	1
		44	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1	1	1	1	1	1
WORD BOUNDARY LD BYTES		45	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1	0	0	1
		46	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0
		47	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1
		50	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	1	0
		51	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1
		52	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
		53	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
		54																																
		55																																
WORD BOUNDARY STORE BYTES		56	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		57	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
		60	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
		61																																
		62																																
		63																																
BDP LD BIN DATA	D	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	1	0	1	0
		65	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1
		66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
		67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1
BDP RIGHT TO LEFT STORE STREAM	E	70	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0
		71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0
		72	0	1	0	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1
		73	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1
BDP LEFT TO RIGHT STORE STREAM	F	74	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
		75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
		76	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1
		77	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
			SOFT CONTROL 2 OUTPUT BITS																													

AC SOFT CONTROL 2 MEMORY MAP (CYCLE 40 MICROCODE)

BIT	DESCRIPTION
0	CLR A/C1 BFR RGTR
1	ENBL C STR END
2	FORCE LD A/C1 BFR
3	MARK MASK MUX SEL 2
4	MARK MASK MUX SEL 1
5	MARK SHIFT CNT MUX SEL 2
6	MARK SHIFT CNT MUX SEL 1
7	ENBL LD AC MICR RGTR (LD BYTE NO WORD BOUND)
8	ENBL LD AC MICR RGTR (LD BYTE WORD BOUND)
9	NOT USED
10	LD A/C1 BFR RGTR
11	ENBL STORE BIT OPN; COMP BYTE SHIFT CNT
12	CLR LD BYTE OPN FF
13	NOT USED
14	ENBL SET END A STR 1 FF
15	STOP SC 2 ADRS CHANGE UNTIL STR A RESPONSE RECEIVED
16	NOT USED
17	SEND AC RESPONSE TO ICP AND LM
18	SEND AC RESPONSE TO ICP AND LM FOR TEST AND SET LOCK INSTR
19	ENBL INCR BYTE SHIFT CNTR
20	HOLD AC A STR BUSY
21	FORCE AC FCTN CODE TO READ AND SET/CLR BIT OPN
22	A/C STR ASSY MUX SEL 1 (STORE DATA)
23	A/C STR ASSY MUX SEL 2 (LOAD DATA)
24	ENBL FINAL LD BIT TO AI STR BFR RGTR
25	LD A/C STR ASSY RGTR
26-31	COMP OF NEXT SC 2 ADRS

Figure 2-4. AC Soft Control 2 Memory Map

AC OPERATION	OPCODE (16)	ADRS (8)	SOFT CONTROL 3 OUTPUT BITS															
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LD/STORE WORD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1																
		2																
		3																
		4																
		5																
		6																
		7																
		10																
		11																
		12																
		13																
		14																
		15																
		16																
		17																
LD AK DESCR	4	20	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1
		21	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0
		22	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
		23																
LD AK DESCR	5	24	1	0	0	1	0	0	0	0	0	1	0	1	0	1	0	1
		25	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0
		26	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
		27																
BDP RIGHT TO LEFT	6	30	1	0	0	1	0	0	0	0	0	1	0	1	1	0	0	1
		31	0	0	0	0	1	0	1	1	1	1	0	1	1	0	1	0
		32	0	1	0	0	0	0	0	0	1	1	0	1	1	0	1	1
		33	0	1	1	0	0	0	0	0	0	1	1	1	1	1	0	0
BDP LEFT TO RIGHT	7	34	1	0	0	1	0	0	0	0	0	1	0	1	1	1	0	1
		35	0	0	1	0	1	0	1	0	1	1	0	1	1	1	1	0
		36	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
		37	0	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0
		40																
		41																
		42																
		43																
		44																
		45																
		46																
		47																
LD IMMED BYTE OR SCALE CNT	A	50	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1
		51	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1	0
		52	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0
		53																
		54																
		55																
		56																
		57																
		60																
		61																
		62																
		63																
INITIALIZE B STREAM	D	64	1	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1
		65	1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0
		66	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1
		67	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0
		70	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0
		71																
		72																
		73																
BDP R → L BDP L → R (CONT)	F	74	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1
		75	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	0
		76	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
		77	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			SOFT CONTROL 3 OUTPUT BITS															

AC PSEUDO SOFT CONTROL 3 (CYCLE 40 MICROCODE)

BIT	DESCRIPTION
0	BLOCK A/B OP TO ADRS ADDER INP B
1	ENBL ADRS ADDER TO B STR ADRS CNTR
2	LD B STR DISASSY CNTR
3	ENBL FEEDBACK PATH TO ADRS ADDER INP B; LD B STR LENGTH CNTR; SEND LD AK DESCR SIGNAL TO BDP
4	ENBL B STR MEM REQ
5	SEND LATCH IMMED DATA TO BDP
6	ENBL DECR B STR LENGTH CNTR; ENBL B STR NO OPN
7	LD FINAL B STR BN RGTR
8	SEND AC RESPONSE TO ICP AND LM
9	HOLD B STR BUSY
10-15	NEXT SC 3 ADRS

Figure 2-5. AC Pseudo Soft Control 3

TRANSLATE RAM CONTENTS
BDP RAM (2)

ADRS	DATA	ADRS	DATA	ADRS	DATA	ADRS	DATA
00	00	40	20	80	C3	C0	7B
01	01	41	A0	81	61	C1	41
02	02	42	A1	82	62	C2	42
03	03	43	A2	83	63	C3	43
04	9C	44	A3	84	64	C4	44
05	09	45	A4	85	65	C5	45
06	86	46	A5	86	66	C6	46
07	7F	47	A6	87	67	C7	47
08	97	48	A7	88	68	C8	48
09	8D	49	A8	89	69	C9	49
0A	8E	4A	5B	8A	C4	CA	E8
0B	0B	4B	2E	8B	C5	CB	E9
0C	0C	4C	3C	8C	C6	CC	EA
0D	0D	4D	28	8D	C7	CD	EB
0E	0E	4E	2B	8E	C8	CE	EC
0F	0F	4F	21	8F	C9	CF	ED
10	10	50	26	90	CA	D0	7D
11	11	51	A9	91	6A	D1	4A
12	12	52	AA	92	6B	D2	4B
13	13	53	AB	93	6C	D3	4C
14	9D	54	AC	94	6D	D4	4D
15	85	55	AD	95	6E	D5	4E
16	08	56	AE	96	6F	D6	4F
17	87	57	AF	97	70	D7	50
18	18	58	B0	98	71	D8	51
19	19	59	B1	99	72	D9	52
1A	92	5A	5D	9A	CB	DA	EE
1B	8F	5B	24	9B	CC	DB	EF
1C	1C	5C	2A	9C	CD	DC	F0
1D	1D	5D	29	9D	CE	DD	F1
1E	1E	5E	3B	9E	CF	DE	F2
1F	1F	5F	5E	9F	D0	DF	F3
20	80	60	2D	A0	D1	E0	5C
21	81	61	2F	A1	7E	E1	9F
22	82	62	B2	A2	73	E2	53
23	83	63	B3	A3	74	E3	54
24	84	64	B4	A4	75	E4	55
25	0A	65	B5	A5	76	E5	56
26	17	66	B6	A6	77	E6	57
27	1B	67	B7	A7	78	E7	58
28	88	68	B8	A8	79	E8	59
29	89	69	B9	A9	7A	E9	5A
2A	8A	6A	7C	AA	D2	EA	F4
2B	8B	6B	2C	AB	D3	EB	F5
2C	8C	6C	25	AC	D4	EC	F6
2D	05	6D	5F	AD	D5	ED	F7
2E	06	6E	3E	AE	D6	EE	F8
2F	07	6F	3F	AF	D7	EF	F9
30	90	70	BA	B0	D8	F0	30
31	91	71	BB	B1	D9	F1	31
32	16	72	BC	B2	DA	F2	32
33	93	73	BD	B3	DB	F3	33
34	94	74	BE	B4	DC	F4	34
35	95	75	BF	B5	DD	F5	35
36	96	76	C0	B6	DE	F6	36
37	04	77	C1	B7	DF	F7	37
38	98	78	C2	B8	E0	F8	38
39	99	79	60	B9	E1	F9	39
3A	9A	7A	3A	BA	E2	FA	FA
3B	9B	7B	23	BB	E3	FB	FB
3C	14	7C	40	BC	E4	FC	FC
3D	15	7D	27	BD	E5	FD	FD
3E	9E	7E	3D	BE	E6	FE	FE
3F	1A	7F	22	BF	E7	FF	FF

BDP RAM(2) 4,6-00 7AFH (4F01)

BDP TRANSLATE ENCODE RAM (CYCLE 40 MICROCODE)

Figure 2-6. BDP Translate Encode RAM

ADRS	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3
	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
00	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
04	0	0	1	1	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
05	0	0	1	0	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
06	0	0	1	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
07	0	0	1	0	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
08	0	0	0	1	0	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
09	0	0	0	0	0	1	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
0A	0	0	1	0	0	1	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
0B	0	0	0	0	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
0C	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
0D	0	0	0	0	1	1	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	1
0E	0	0	0	0	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
0F	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
10	0	0	0	1	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
11	0	0	0	1	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
12	0	0	0	1	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
13	0	0	0	1	0	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
14	0	0	1	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
15	0	0	1	1	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
16	0	0	1	1	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
17	0	0	1	0	0	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
18	0	0	0	1	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
19	0	0	0	1	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
1A	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
1B	0	0	1	0	0	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
1C	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
1D	0	0	0	1	1	1	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	1
1E	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
1F	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
20	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
21	0	1	0	0	1	1	1	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0
22	0	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
23	0	1	1	1	1	0	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
24	0	1	0	1	1	0	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
25	0	1	1	0	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
26	0	1	0	1	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0
27	0	1	1	1	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
28	0	1	0	0	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
29	0	1	0	1	1	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
2A	0	1	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
2B	0	1	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
2C	0	1	1	0	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
2D	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	1
2E	0	1	0	0	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
2F	0	1	1	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
30	1	1	1	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
31	1	1	1	1	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0
32	1	1	1	1	0	0	1	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0
33	1	1	1	1	0	0	1	1	1	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0
34	1	1	1	1	0	1	0	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0
35	1	1	1	1	0	1	0	1	1	0	1	1	1	0	0	0	0	1	0	1	0	0	0	0
36	1	1	1	1	0	1	1	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0
37	1	1	1	1	0	1	1	1	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0
38	1	1	1	1	1	0	0	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0
39	1	1	1	1	1	0	0	1	1	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0
3A	0	1	1	1	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
3B	0	1	0	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
3C	0	1	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
3D	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1
3E	0	1	1	0	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
3F	0	1	1	0	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0

ADRS	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3
	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
40	0	1	1	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
41	1	1	0	0	0	0	0	1	1	0	1	1	1	0	1	0	0	0	0	1	0	0	0	0
42	1	1	0	0	0	0	1	0	1	0	1	1	1	0	1	0	0	0	1	0	0	0	0	0
43	1	1	0	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	1	1	0	0	0	0
44	1	1	0	0	0	1	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0
45	1	1	0	0	0	1	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	0	0	0
46	1	1	0	0	0	1	1	0	1	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0
47	1	1	0	0	0	1	1	1	1	0	1	1	1	0	1	0	0	1	1	1	0	0	0	0
48	1	1	0	0	1	0	0	0	1	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0
49	1	1	0	0	1	0	0	1	1	0	1	1	1	0	1	0	1	0	0	1	0	0	0	0
4A	1	1	0	1	0	0	0	1	0	0	1	1	1	0	1	0	0	0	0	1	1	0	0	0
4B	1	1	0	1	0	0	1	0	0	0	1	1	1	0	1	0	0	0	1	0	1	0	0	0
4C	1	1	0	1	0	0	1	1	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0
4D	1	1	0	1	0	1	0	0	0	0	1	1	1	0	1	0	0	1	0	0	1	0	0	1
4E	1	1	0	1	0	1	0	1	0	0	1	1	1	0	1	0	0	1	0	1	1	0	0	0
4F	1	1	0	1	0	1	1	0	0	0	1	1	1	0	1	0	0	1	1	0	1	0	0	0
50	1	1	0	1	0	1	1	1	1	0	1	1	1	0	1	0	0	1	1	1	1	0	0	0
51	1	1	0	1	1	0	0	0	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0	0
52	1	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0	1	0	0	1	1	0	0	0
53	1	1	1	0	0	0	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
54	1	1	1	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
55	1	1	1	0	0	1	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
56	1	1	1	0	0	1	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
57	1	1	1	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
58	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
59	1	1	1	0	1	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
5A	1	1	1	0	1	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
5B	0	1	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
5C	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
5D	0	1	0	1	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1
5E	0	1	0	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
5F	0	1	1	0	1	1	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
60	0	1	1	1	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
61	1	0	0	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
62	1	0	0	0	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
63	1	0	0	0	0	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
64	1	0	0	0	0	1	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
65	1	0	0	0	0	1	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
66	1	0	0	0	0	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
67	1	0	0	0	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
68	1	0	0	0	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
69	1	0	0	0	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
6A	1	0	0	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
6B	1	0	0	1	0	0	1	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
6C	1	0	0	1	0	0	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
6D	1	0	0	1	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1
6E	1	0	0	1	0	1	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
6F	1	0	0	1	0	1	1	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
70	1	0	0	1	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
71	1	0	0	1	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
72	1	0	0	1	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
73	1	0	1	0	0	0	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
74	1	0	1	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
75	1	0	1	0	0	1	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
76	1	0	1	0	0	1	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
77	1	0	1	0	0	1	1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
78	1	0	1	0	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
79	1	0	1	0	1	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
7A	1	0	1	0	1	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
7B	1	1	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0
7C	0	1	1	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
7D	1	1	0	1	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	0	0	1
7E	1	0	1	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
7F	0	0	0	0	0	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0

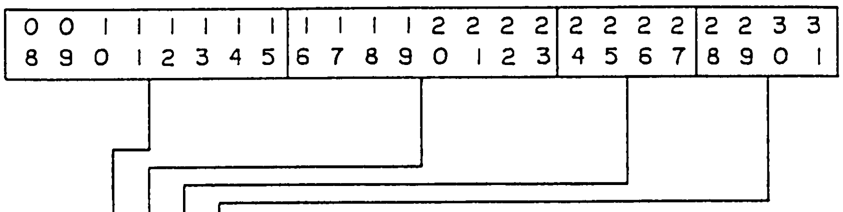
Figure 2-7. BDP A, B Stream Decode RAM (Sheet 1 of 3)

ADRS	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
80	0	0	1	0	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
81	0	0	1	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
82	0	0	1	0	0	0	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
83	0	0	1	0	0	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
84	0	0	1	0	0	1	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
85	0	0	0	1	0	1	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
87	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
88	0	0	1	0	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
89	0	0	1	0	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
8A	0	0	1	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
8B	0	0	1	0	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
8C	0	0	1	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
8D	0	0	0	0	1	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1
8E	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
8F	0	0	0	1	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
90	0	0	1	1	0	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
91	0	0	1	1	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
92	0	0	0	1	1	0	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
93	0	0	1	1	0	0	1	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
94	0	0	1	1	0	1	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
95	0	0	1	1	0	1	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
96	0	0	1	1	0	1	1	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
97	0	0	0	0	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
98	0	0	1	1	1	0	0	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
99	0	0	1	1	1	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
9A	0	0	1	1	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
9B	0	0	1	1	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0
9C	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0
9D	0	0	0	1	0	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1
9E	0	0	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
9F	1	1	1	0	0	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
A0	0	1	0	0	0	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A1	0	1	0	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A2	0	1	0	0	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A3	0	1	0	0	0	1	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A4	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A5	0	1	0	0	0	1	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A6	0	1	0	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A7	0	1	0	0	1	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A8	0	1	0	0	1	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
A9	0	1	0	1	0	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
AA	0	1	0	1	0	0	1	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
AB	0	1	0	1	0	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
AC	0	1	0	1	0	1	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
AD	0	1	0	1	0	1	0	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	1
AE	0	1	0	1	0	1	1	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
AF	0	1	0	1	0	1	1	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B0	0	1	0	1	1	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B1	0	1	0	1	1	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B2	0	1	1	0	0	0	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B3	0	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B4	0	1	1	0	0	1	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B5	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B6	0	1	1	0	0	1	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B7	0	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B8	0	1	1	0	1	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
B9	0	1	1	0	1	0	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
BA	0	1	1	1	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
BB	0	1	1	1	0	0	0	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
BC	0	1	1	1	0	0	1	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
BD	0	1	1	1	0	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	1
BE	0	1	1	1	0	1	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
BF	0	1	1	1	0	1	0	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0

ADRS	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
C0	0	1	1	1	0	1	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
C1	0	1	1	1	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
C2	0	1	1	1	1	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
C3	1	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
C4	1	0	0	0	1	0	1	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
C5	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0
C6	1	0	0	0	1	1	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
C7	1	0	0	0	1	1	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0
C8	1	0	0	0	1	1	1	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
C9	1	0	0	0	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
CA	1	0	0	1	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0
CB	1	0	0	1	1	0	1	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
CC	1	0	0	1	1	0	1	1	0	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0
CD	1	0	0	1	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	1
CE	1	0	0	1	1	1	0	1	0	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0
CF	1	0	0	1	1	1	1	0	0	1	0	0	1	1		0	0	0	0	0	0	0	0	0
D0	1	0	0	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0
D1	1	0	1	0	0	0	0	0	1	1	1	1	1		1	0	0	0	0	0	0	0	0	0
D2	1	0	1	0	1	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
D3	1	0	1	0	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
D4	1	0	1	0	1	1	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
D5	1	0	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
D6	1	0	1	0	1	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
D7	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
D8	1	0	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
D9	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
DA	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
DB	1	0	1	1	0	0	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
DC	1	0	1	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
DD	1	0	1	1	0	1	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
DE	1	0	1	1	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
DF	1	0	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
E0	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
E1	1	0	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
E2	1	0	1	1	1	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
E3	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
E4	1	0	1	1	1	1	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
E5	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
E6	1	0	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
E7	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
E8	1	1	0	0	1	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
E9	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
EA	1	1	0	0	1	1	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
EB	1	1	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
EC	1	1	0	0	1	1	1	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
ED	1	1	0	0	1	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	1
EE	1	1	0	1	1	0	1	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
EF	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
F0	1	1	0	1	1	1	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
F2	1	1	0	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F3	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F4	1	1	1	0	1	0	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F5	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
F6	1	1	1	0	1	1	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F7	1	1	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
F8	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
F9	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FA	1	1	1	1	1	0	1	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FB	1	1	1	1	1	0	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	1	0	0
FC	1	1	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FD	1	1	1	1	1	1	0	1	0	1	0	1	1	1	1	0	0	0	0	0	0	1	0	1
FE	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
FF	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0

Figure 2-7. BDP A, B Stream Decode RAM (Sheet 2 of 3)

DATA FORMAT



SIGN

(0=POS., 1=NEG.)
BIT 28 = COMBINED SIGN
BIT 29 = TRANSLATE PACKED SIGN
BIT 30 = SEP. HOLLERITH SIGN
BIT 31 = PACKED SIGN

SIGN DIGIT

NUMERIC DIGIT CONTAINED IN A COMBINED SIGN

VALIDATION

(0=VALID, 1=INVALID)
BIT 16 = PACKED RIGHT DIGIT (SIGN + $\overline{\text{NUMERIC DIGIT}}$) △1
BIT 17 = PACKED LEFT DIGIT - NUMERIC DIGIT
BIT 18 = PACKED TRANSLATE RIGHT DIGIT (SIGN + $\overline{\text{NUMERIC DIGIT}}$) △1
BIT 19 = PACKED TRANSLATE LEFT DIGIT – NUMERIC DIGIT
BIT 20 = SEP. HOLLERITH SIGN
BIT 21 = COMBINED SIGN
BIT 22 = ASCII DATA
BIT 23 = NOT USED (LOGICAL ZERO)

TRANSLATED

STRAIGHT TRANSLATION FROM TRANSLATE DATA TYPE

BDP RAM (0) = AJ DECODE - 7CLH (5L01)
BDP RAM (1) = AK DECODE - 7CLH (5L02)

NOTE:
△1 0=VALID, 1=INVALID FOR DATA DIGIT,
1=VALID, 0=INVALID FOR SIGN DIGIT.

BDP A,B STREAM DECODE RAM (CYCLE 40 MICROCODE)

Figure 2-7. BDP A, B Stream Decode RAM (Sheet 3 of 3)

ADRS	14 15	16 19	20 23	24 27	28 31	14 15	16 19	20 23	24 27	28 31
00	0	0	0	0	0	0	0	0	0	0
01	0	0	1	0	1	0	0	2	5	6
02	0	0	2	0	2	0	0	5	1	2
03	0	0	3	0	3	0	0	7	6	8
04	0	0	4	0	4	0	1	0	2	4
05	0	0	5	0	5	0	1	2	8	0
06	0	0	6	0	6	0	1	5	3	6
07	0	0	7	0	7	0	1	7	9	2
08	0	0	8	0	8	0	2	0	4	8
09	0	0	9	0	9	0	2	3	0	4
0A	0	1	0	0	0	0	0	0	0	0
0B	0	1	1	0	0	0	0	0	0	0
0C	0	1	2	0	0	0	0	0	0	0
0D	0	1	3	0	0	0	0	0	0	0
0E	0	1	4	0	0	0	0	0	0	0
0F	0	1	5	0	0	0	0	0	0	0
10	0	1	6	0	A	0	2	5	6	0
11	0	1	7	0	B	0	2	8	1	6
12	0	1	8	0	C	0	3	0	7	2
13	0	1	9	0	D	0	3	3	2	8
14	0	2	0	0	E	0	3	5	8	4
15	0	2	1	0	F	0	3	8	4	0
16	0	2	2	1	0	0	4	0	9	6
17	0	2	3	1	1	0	4	3	5	2
18	0	2	4	1	2	0	4	6	0	8
19	0	2	5	1	3	0	4	8	6	4
1A	0	2	6	0	0	0	0	0	0	0
1B	0	2	7	0	0	0	0	0	0	0
1C	0	2	8	0	0	0	0	0	0	0
1D	0	2	9	0	0	0	0	0	0	0
1E	0	3	0	0	0	0	0	0	0	0
1F	0	3	1	0	0	0	0	0	0	0
20	0	3	2	1	4	0	5	1	2	0
21	0	3	3	1	5	0	5	3	7	6
22	0	3	4	1	6	0	5	6	3	2
23	0	3	5	1	7	0	5	8	8	8
24	0	3	6	1	8	0	6	1	4	4
25	0	3	7	1	9	0	6	4	0	0
26	0	3	8	1	A	0	6	6	5	6
27	0	3	9	1	B	0	6	9	1	2
28	0	4	0	1	C	0	7	1	6	8
29	0	4	1	1	D	0	7	4	2	4
2A	0	4	2	0	0	0	0	0	0	0
2B	0	4	3	0	0	0	0	0	0	0
2C	0	4	4	0	0	0	0	0	0	0
2D	0	4	5	0	0	0	0	0	0	0
2E	0	4	6	0	0	0	0	0	0	0
2F	0	4	7	0	0	0	0	0	0	0
30	0	4	8	1	E	0	7	6	8	0
31	0	4	9	1	F	0	7	9	3	6
32	0	5	0	2	0	0	8	1	9	2
33	0	5	1	2	1	0	8	4	4	8
34	0	5	2	2	2	0	8	7	0	4
35	0	5	3	2	3	0	8	9	6	0
36	0	5	4	2	4	0	9	2	1	6
37	0	5	5	2	5	0	9	4	7	2
38	0	5	6	2	6	0	9	7	2	8
39	0	5	7	2	7	0	9	9	8	4
3A	0	5	8	0	0	0	0	0	0	0
3B	0	5	9	0	0	0	0	0	0	0
3C	0	6	0	0	0	0	0	0	0	0
3D	0	6	1	0	0	0	0	0	0	0
3E	0	6	2	0	0	0	0	0	0	0
3F	0	6	3	0	0	0	0	0	0	0

BINARY-TO-DECIMAL

OR

DECIMAL-TO —— BINARY

OR

DECIMAL ——→ X256^{10}

ADRS	14 15	16 19	20 23	24 27	28 31	14 15	16 19	20 23	24 27	28 31
40	0	6	4	2	8	1	0	2	4	0
41	0	6	5	2	9	1	0	4	9	6
42	0	6	6	2	A	1	0	7	5	2
43	0	6	7	2	B	1	1	0	0	8
44	0	6	8	2	C	1	1	2	6	4
45	0	6	9	2	D	1	1	5	2	0
46	0	7	0	2	E	1	1	7	7	6
47	0	7	1	2	F	1	2	0	3	2
48	0	7	2	3	0	1	2	2	8	8
49	0	7	3	3	1	1	2	5	4	4
4A	0	7	4	0	0	0	0	0	0	0
4B	0	7	5	0	0	0	0	0	0	0
4C	0	7	6	0	0	0	0	0	0	0
4D	0	7	7	0	0	0	0	0	0	0
4E	0	7	8	0	0	0	0	0	0	0
4F	0	7	9	0	0	0	0	0	0	0
50	0	8	0	3	2	1	2	8	0	0
51	0	8	1	3	3	1	3	0	5	6
52	0	8	2	3	4	1	3	3	1	2
53	0	8	3	3	5	1	3	5	6	8
54	0	8	4	3	6	1	3	8	2	4
55	0	8	5	3	7	1	4	0	8	0
56	0	8	6	3	8	1	4	3	3	6
57	0	8	7	3	9	1	4	5	9	2
58	0	8	8	3	A	1	4	8	4	8
59	0	8	9	3	B	1	5	1	0	4
5A	0	9	0	0	0	0	0	0	0	0
5B	0	9	1	0	0	0	0	0	0	0
5C	0	9	2	0	0	0	0	0	0	0
5D	0	9	3	0	0	0	0	0	0	0
5E	0	9	4	0	0	0	0	0	0	0
5F	0	9	5	0	0	0	0	0	0	0
60	0	9	6	3	C	1	5	3	6	0
61	0	9	7	3	D	1	5	6	1	6
62	0	9	8	3	E	1	5	8	7	2
63	0	9	9	3	F	1	6	1	2	8
64	1	0	0	4	0	1	6	3	8	4
65	1	0	1	4	1	1	6	6	4	0
66	1	0	2	4	2	1	6	8	9	6
67	1	0	3	4	3	1	7	1	5	2
68	1	0	4	4	4	1	7	4	0	8
69	1	0	5	4	5	1	7	6	6	4
6A	1	0	6	0	0	0	0	0	0	0
6B	1	0	7	0	0	0	0	0	0	0
6C	1	0	8	0	0	0	0	0	0	0
6D	1	0	9	0	0	0	0	0	0	0
6E	1	1	0	0	0	0	0	0	0	0
6F	1	1	1	0	0	0	0	0	0	0
70	1	1	2	4	6	1	7	9	2	0
71	1	1	3	4	7	1	8	1	7	6
72	1	1	4	4	8	1	8	4	3	2
73	1	1	5	4	9	1	8	6	8	8
74	1	1	6	4	A	1	8	9	4	4
75	1	1	7	4	B	1	9	2	0	0
76	1	1	8	4	C	1	9	4	5	6
77	1	1	9	4	D	1	9	7	1	2
78	1	2	0	4	E	1	9	9	6	8
79	1	2	1	4	F	2	0	2	2	4
7A	1	2	2	0	0	0	0	0	0	0
7B	1	2	3	0	0	0	0	0	0	0
7C	1	2	4	0	0	0	0	0	0	0
7D	1	2	5	0	0	0	0	0	0	0
7E	1	2	6	0	0	0	0	0	0	0
7F	1	2	7	0	0	0	0	0	0	0

BDP RAM (3)
7 AFH(4F01)
BDP 4.6-03

BDP RAM (5)
7 AFH(4F01)
BDP 4.11-03

Figure 2-8. BDP Convert to Binary/Decimal and Multiply by 256 RAMs (Sheet 1 of 2)

ADRS	14	16	20	24	28	14	16	20	24	28
	15	19	23	27	31	15	19	23	27	31
80	1	2	8	5	0	2	0	4	8	0
81	1	2	9	5	1	2	0	7	3	6
82	1	3	0	5	2	2	0	9	9	2
83	1	3	1	5	3	2	1	2	4	8
84	1	3	2	5	4	2	1	5	0	4
85	1	3	3	5	5	2	1	7	6	0
86	1	3	4	5	6	2	2	0	1	6
87	1	3	5	5	7	2	2	2	7	2
88	1	3	6	5	8	2	2	5	2	8
89	1	3	7	5	9	2	2	7	8	4
8A	1	3	8	0	0	0	0	0	0	0
8B	1	3	9	0	0	0	0	0	0	0
8C	1	4	0	0	0	0	0	0	0	0
8D	1	4	1	0	0	0	0	0	0	0
8E	1	4	2	0	0	0	0	0	0	0
8F	1	4	3	0	0	0	0	0	0	0
90	1	4	4	5	A	2	3	0	4	0
91	1	4	5	5	B	2	3	2	9	6
92	1	4	6	5	C	2	3	5	5	2
93	1	4	7	5	D	2	3	8	0	8
94	1	4	8	5	E	2	4	0	6	4
95	1	4	9	5	F	2	4	3	2	0
96	1	5	0	6	0	2	4	5	7	6
97	1	5	1	6	1	2	4	8	3	2
98	1	5	2	6	2	2	5	0	8	8
99	1	5	3	6	3	2	5	3	4	4
9A	1	5	4	0	0	0	0	0	0	0
9B	1	5	5	0	0	0	0	0	0	0
9C	1	5	6	0	0	0	0	0	0	0
9D	1	5	7	0	0	0	0	0	0	0
9E	1	5	8	0	0	0	0	0	0	0
9F	1	5	9	0	0	0	0	0	0	0
A0	1	6	0	0	0	THE ADDRESSES AO←OFF ARE FILLED WITH ZEROS IN THIS MEMORY				
A1	1	6	1	0	0					
A2	1	6	2	0	0					
A3	1	6	3	0	0					
A4	1	6	4	0	0					
A5	1	6	5	0	0					
A6	1	6	6	0	0					
A7	1	6	7	0	0					
A8	1	6	8	0	0					
A9	1	6	9	0	0					
AA	1	7	0	0	0					
AB	1	7	1	0	0					
AC	1	7	2	0	0					
AD	1	7	3	0	0					
AE	1	7	4	0	0					
AF	1	7	5	0	0					
B0	1	7	6	0	0					
B1	1	7	7	0	0					
B2	1	7	8	0	0					
B3	1	7	9	0	0					
B4	1	8	0	0	0					
B5	1	8	1	0	0					
B6	1	8	2	0	0					
B7	1	8	3	0	0					
B8	1	8	4	0	0					
B9	1	8	5	0	0					
BA	1	8	6	0	0					
BB	1	8	7	0	0					
BC	1	8	8	0	0					
BD	1	8	9	0	0					
BE	1	9	0	0	0					
BF	1	9	1	0	0					

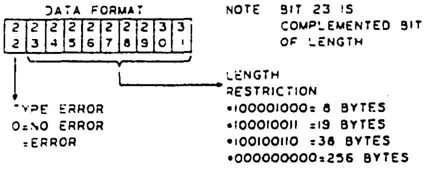
ADRS	14	16	20	24	28
	15	19	23	27	31
C0	1	9	2	0	0
C1	1	9	3	0	0
C2	1	9	4	0	0
C3	1	9	5	0	0
C4	1	9	6	0	0
C5	1	9	7	0	0
C6	1	9	8	0	0
C7	1	9	9	0	0
C8	2	0	0	0	0
C9	2	0	1	0	0
CA	2	0	2	0	0
CB	2	0	3	0	0
CC	2	0	4	0	0
CD	2	0	5	0	0
CE	2	0	6	0	0
CF	2	0	7	0	0
D0	2	0	8	0	0
D1	2	0	9	0	0
D2	2	1	0	0	0
D3	2	1	1	0	0
D4	2	1	2	0	0
D5	2	1	3	0	0
D6	2	1	4	0	0
D7	2	1	5	0	0
D8	2	1	6	0	0
D9	2	1	7	0	0
DA	2	1	8	0	0
DB	2	1	9	0	0
DC	2	2	0	0	0
DD	2	2	1	0	0
DE	2	2	2	0	0
DF	2	2	3	0	0
E0	2	2	4	0	0
E1	2	2	5	0	0
E2	2	2	6	0	0
E3	2	2	7	0	0
E4	2	2	8	0	0
E5	2	2	9	0	0
E6	2	3	0	0	0
E7	2	3	1	0	0
E8	2	3	2	0	0
E9	2	3	3	0	0
EA	2	3	4	0	0
EB	2	3	5	0	0
EC	2	3	6	0	0
ED	2	3	7	0	0
EE	2	3	8	0	0
EF	2	3	9	0	0
F0	2	4	0	0	0
F1	2	4	1	0	0
F2	2	4	2	0	0
F3	2	4	3	0	0
F4	2	4	4	0	0
F5	2	4	5	0	0
F6	2	4	6	0	0
F7	2	4	7	0	0
F8	2	4	8	0	0
F9	2	4	9	0	0
FA	2	5	0	0	0
FB	2	5	1	0	0
FC	2	5	2	0	0
FD	2	5	3	0	0
FE	2	5	4	0	0
FF	2	5	5	0	0

Figure 2-8. BDP Convert to Binary/Decimal and Multiply by 256 RAMs (Sheet 2 of 2)

ADRS	BIT NUMBER										TYPE	
	22	23	24	25	26	27	28	29	30	31		
00	0	1	0	0	0	1	0	0	1	1	0	
01	0	1	0	0	0	1	0	0	1	1	1	
02	0	1	0	0	0	1	0	0	1	1	2	
03	0	1	0	0	0	1	0	0	1	1	3	
04	0	1	0	0	1	0	0	1	1	0	4	
05	0	1	0	0	1	0	0	1	1	0	5	
06	0	1	0	0	1	0	0	1	1	0	6	
07	1	0	1	1	1	1	1	1	1	1	7	Aj
08	1	0	1	1	1	1	1	1	1	1	8	
09	1	0	1	1	1	1	1	1	1	1	9	
0A	1	0	1	1	1	1	1	1	1	1	10	
0B	1	0	1	1	1	1	1	1	1	1	11	
0C	0	1	0	0	0	1	0	0	1	1	12	
0D	0	1	0	0	0	1	0	0	1	1	13	
0E	1	0	1	1	1	1	1	1	1	1	14	
0F	1	0	1	1	1	1	1	1	1	1	15	GROUP 0
10	0	1	0	0	0	1	0	0	1	1	0	
11	0	1	0	0	0	1	0	0	1	1	1	
12	0	1	0	0	0	1	0	0	1	1	2	
13	0	1	0	0	0	1	0	0	1	1	3	
14	0	1	0	0	1	0	0	1	1	0	4	
15	0	1	0	0	1	0	0	1	1	0	5	
16	0	1	0	0	1	0	0	1	1	0	6	
17	1	0	1	1	1	1	1	1	1	1	7	Ak
18	1	0	1	1	1	1	1	1	1	1	8	
19	1	0	1	1	1	1	1	1	1	1	9	
1A	1	0	1	1	1	1	1	1	1	1	10	
1B	1	0	1	1	1	1	1	1	1	1	11	
1C	0	1	0	0	0	1	0	0	1	1	12	
1D	0	1	0	0	0	1	0	0	1	1	13	
1E	1	0	1	1	1	1	1	1	1	1	14	
1F	1	0	1	1	1	1	1	1	1	1	15	
20	0	1	0	0	0	1	0	0	1	1	0	
21	0	1	0	0	0	1	0	0	1	1	1	
22	0	1	0	0	0	1	0	0	1	1	2	
23	0	1	0	0	0	1	0	0	1	1	3	
24	0	1	0	0	1	0	0	1	1	0	4	
25	0	1	0	0	1	0	0	1	1	0	5	
26	0	1	0	0	1	0	0	1	1	0	6	
27	1	0	1	1	1	1	1	1	1	1	7	Aj
28	1	0	1	1	1	1	1	1	1	1	8	
29	1	0	1	1	1	1	1	1	1	1	9	
2A	1	0	1	1	1	1	1	1	1	1	10	
2B	1	0	1	1	1	1	1	1	1	1	11	
2C	0	1	0	0	0	1	0	0	1	1	12	
2D	0	1	0	0	0	1	0	0	1	1	13	
2E	1	0	1	1	1	1	1	1	1	1	14	
2F	1	0	1	1	1	1	1	1	1	1	15	GROUP 1
30	0	1	0	0	0	1	0	0	1	1	0	
31	0	1	0	0	0	1	0	0	1	1	1	
32	0	1	0	0	0	1	0	0	1	1	2	
33	0	1	0	0	0	1	0	0	1	1	3	
34	0	1	0	0	1	0	0	1	1	0	4	
35	0	1	0	0	1	0	0	1	1	0	5	
36	0	1	0	0	1	0	0	1	1	0	6	
37	1	0	1	1	1	1	1	1	1	1	7	Ak
38	1	0	1	1	1	1	1	1	1	1	8	
39	1	0	1	1	1	1	1	1	1	1	9	
3A	1	0	1	1	1	1	1	1	1	1	10	
3B	1	0	1	1	1	1	1	1	1	1	11	
3C	0	1	0	0	0	1	0	0	1	1	12	
3D	0	1	0	0	0	1	0	0	1	1	13	
3E	1	0	1	1	1	1	1	1	1	1	14	
3F	1	0	1	1	1	1	1	1	1	1	15	

ADRS	BIT NUMBER										TYPE	
	22	23	24	25	26	27	28	29	30	31		
40	0	1	0	0	0	1	0	0	1	1	0	
41	0	1	0	0	0	1	0	0	1	1	1	
42	0	1	0	0	0	1	0	0	1	1	2	
43	0	1	0	0	0	1	0	0	1	1	3	
44	0	1	0	0	1	0	0	1	1	0	4	
45	0	1	0	0	1	0	0	1	1	0	5	
46	0	1	0	0	1	0	0	1	1	0	6	
47	0	1	0	0	1	0	0	1	1	0	7	Aj
48	0	1	0	0	1	0	0	1	1	0	8	
49	1	0	1	1	1	1	1	1	1	1	9	
4A	0	1	0	0	0	0	1	0	0	0	10	
4B	0	1	0	0	0	0	1	0	0	0	11	
4C	0	1	0	0	0	1	0	0	1	1	12	
4D	0	1	0	0	0	1	0	0	1	1	13	
4E	0	1	0	0	0	0	1	0	0	0	14	
4F	0	1	0	0	0	0	1	0	0	0	15	GROUP 2
50	0	1	0	0	0	1	0	0	1	1	0	
51	0	1	0	0	0	1	0	0	1	1	1	
52	0	1	0	0	0	1	0	0	1	1	2	
53	0	1	0	0	0	1	0	0	1	1	3	
54	0	1	0	0	1	0	0	1	1	0	4	
55	0	1	0	0	1	0	0	1	1	0	5	
56	0	1	0	0	1	0	0	1	1	0	6	
57	0	1	0	0	1	0	0	1	1	0	7	Ak
58	0	1	0	0	1	0	0	1	1	0	8	
59	1	0	1	1	1	1	1	1	1	1	9	
5A	0	1	0	0	0	0	1	0	0	0	10	
5B	0	1	0	0	0	0	1	0	0	0	11	
5C	0	1	0	0	0	1	0	0	1	1	12	
5D	0	1	0	0	0	1	0	0	1	1	13	
5E	0	1	0	0	0	0	1	0	0	0	14	
5F	0	1	0	0	0	0	1	0	0	0	15	
60	0	1	0	0	0	1	0	0	1	1	0	
61	0	1	0	0	0	1	0	0	1	1	1	
62	0	1	0	0	0	1	0	0	1	1	2	
63	0	1	0	0	0	1	0	0	1	1	3	
64	0	1	0	0	1	0	0	1	1	0	4	
65	0	1	0	0	1	0	0	1	1	0	5	
66	0	1	0	0	1	0	0	1	1	0	6	
67	0	1	0	0	1	0	0	1	1	0	7	Aj
68	0	1	0	0	1	0	0	1	1	0	8	
69	0	0	0	0	0	0	0	0	0	0	9	
6A	1	0	1	1	1	1	1	1	1	1	10	
6B	1	0	1	1	1	1	1	1	1	1	11	
6C	0	1	0	0	0	1	0	0	1	1	12	
6D	0	1	0	0	0	1	0	0	1	1	13	
6E	1	0	1	1	1	1	1	1	1	1	14	
6F	1	0	1	1	1	1	1	1	1	1	15	GROUP 3
70	0	0	0	0	0	0	0	0	0	0	0	
71	0	0	0	0	0	0	0	0	0	0	1	
72	0	0	0	0	0	0	0	0	0	0	2	
73	0	0	0	0	0	0	0	0	0	0	3	
74	0	0	0	0	0	0	0	0	0	0	4	
75	0	0	0	0	0	0	0	0	0	0	5	
76	0	0	0	0	0	0	0	0	0	0	6	
77	0	0	0	0	0	0	0	0	0	0	7	Ak
78	0	0	0	0	0	0	0	0	0	0	8	
79	0	0	0	0	0	0	0	0	0	0	9	
7A	0	0	0	0	0	0	0	0	0	0	10	
7B	0	0	0	0	0	0	0	0	0	0	11	
7C	0	0	0	0	0	0	0	0	0	0	12	
7D	0	0	0	0	0	0	0	0	0	0	13	
7E	0	0	0	0	0	0	0	0	0	0	14	
7F	0	0	0	0	0	0	0	0	0	0	15	

BDP RAM (4) 4.11-00 7AFH (4F02)



NOTE BIT 23 IS COMPLEMENTED BIT 0 OF LENGTH

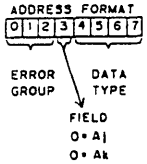


Figure 2-9. BDP Instruction Specification Error RAM (Sheet 1 of 2)

ADRS	BIT NUMBER										TYPE		
	22	23	24	25	26	27	28	29	30	31			
80	0	0	0	0	0	0	0	0	0	0	0	Aj	GROUP 4
81	0	0	0	0	0	0	0	0	0	0	1		
82	0	0	0	0	0	0	0	0	0	0	2		
83	0	0	0	0	0	0	0	0	0	0	3		
84	0	0	0	0	0	0	0	0	0	0	4		
85	0	0	0	0	0	0	0	0	0	0	5		
86	0	0	0	0	0	0	0	0	0	0	6		
87	0	0	0	0	0	0	0	0	0	0	7		
88	0	0	0	0	0	0	0	0	0	0	8		
89	0	0	0	0	0	0	0	0	0	0	9		
8A	0	0	0	0	0	0	0	0	0	0	10		
8B	0	0	0	0	0	0	0	0	0	0	11		
8C	0	0	0	0	0	0	0	0	0	0	12		
8D	0	0	0	0	0	0	0	0	0	0	13		
8E	0	0	0	0	0	0	0	0	0	0	14		
8F	0	0	0	0	0	0	0	0	0	0	15		
90	1	0	1	1	1	1	1	1	1	1	0	Ak	
91	1	0	1	1	1	1	1	1	1	1	1		
92	1	0	1	1	1	1	1	1	1	1	2		
93	1	0	1	1	1	1	1	1	1	1	3		
94	1	0	1	1	1	1	1	1	1	1	4		
95	1	0	1	1	1	1	1	1	1	1	5		
96	1	0	1	1	1	1	1	1	1	1	6		
97	1	0	1	1	1	1	1	1	1	1	7		
98	1	0	1	1	1	1	1	1	1	1	8		
99	1	0	1	1	1	1	1	1	1	1	9		
9A	0	1	0	0	0	0	1	0	0	0	10		
9B	0	1	0	0	0	0	1	0	0	0	11		
9C	1	0	1	1	1	1	1	1	1	1	12		
9D	1	0	1	1	1	1	1	1	1	1	13		
9E	0	1	0	0	0	0	1	0	0	0	14		
9F	0	1	0	0	0	0	1	0	0	0	15		
A0	0	0	0	0	0	0	0	0	0	0	0	Aj	GROUP 5
A1	0	0	0	0	0	0	0	0	0	0	1		
A2	0	0	0	0	0	0	0	0	0	0	2		
A3	0	0	0	0	0	0	0	0	0	0	3		
A4	0	0	0	0	0	0	0	0	0	0	4		
A5	0	0	0	0	0	0	0	0	0	0	5		
A6	0	0	0	0	0	0	0	0	0	0	6		
A7	0	0	0	0	0	0	0	0	0	0	7		
A8	0	0	0	0	0	0	0	0	0	0	8		
A9	0	0	0	0	0	0	0	0	0	0	9		
AA	0	0	0	0	0	0	0	0	0	0	10		
AB	0	0	0	0	0	0	0	0	0	0	11		
AC	0	0	0	0	0	0	0	0	0	0	12		
AD	0	0	0	0	0	0	0	0	0	0	13		
AE	0	0	0	0	0	0	0	0	0	0	14		
AF	0	0	0	0	0	0	0	0	0	0	15		
B0	0	1	0	0	0	1	0	0	1	1	0	Ak	
B1	0	1	0	0	0	1	0	0	1	1	1		
B2	0	1	0	0	0	1	0	0	1	1	2		
B3	0	1	0	0	0	1	0	0	1	1	3		
B4	0	1	0	0	1	0	0	1	1	0	4		
B5	0	1	0	0	1	0	0	1	1	0	5		
B6	0	1	0	0	1	0	0	1	1	0	6		
B7	1	0	1	1	1	1	1	1	1	1	7		
B8	1	0	1	1	1	1	1	1	1	1	8		
B9	1	0	1	1	1	1	1	1	1	1	9		
BA	1	0	1	1	1	1	1	1	1	1	10		
BB	1	0	1	1	1	1	1	1	1	1	11		
BC	0	1	0	0	0	1	0	0	1	1	12		
BD	0	1	0	0	0	1	0	0	1	1	13		
BE	1	0	1	1	1	1	1	1	1	1	14		
BF	1	0	1	1	1	1	1	1	1	1	15		

ADRS	BIT NUMBER										TYPE		
	22	23	24	25	26	27	28	29	30	31			
C0	0	0	0	0	0	0	0	0	0	0	0	Aj	GROUP 6
C1	0	0	0	0	0	0	0	0	0	0	1		
C2	0	0	0	0	0	0	0	0	0	0	2		
C3	0	0	0	0	0	0	0	0	0	0	3		
C4	0	0	0	0	0	0	0	0	0	0	4		
C5	0	0	0	0	0	0	0	0	0	0	5		
C6	0	0	0	0	0	0	0	0	0	0	6		
C7	0	0	0	0	0	0	0	0	0	0	7		
C8	0	0	0	0	0	0	0	0	0	0	8		
C9	0	0	0	0	0	0	0	0	0	0	9		
CA	0	0	0	0	0	0	0	0	0	0	10		
CB	0	0	0	0	0	0	0	0	0	0	11		
CC	0	0	0	0	0	0	0	0	0	0	12		
CD	0	0	0	0	0	0	0	0	0	0	13		
CE	0	0	0	0	0	0	0	0	0	0	14		
CF	0	0	0	0	0	0	0	0	0	0	15		
D0	0	0	0	0	0	0	0	0	0	0	0	Ak	
D1	0	0	0	0	0	0	0	0	0	0	1		
D2	0	0	0	0	0	0	0	0	0	0	2		
D3	0	0	0	0	0	0	0	0	0	0	3		
D4	0	0	0	0	0	0	0	0	0	0	4		
D5	0	0	0	0	0	0	0	0	0	0	5		
D6	0	0	0	0	0	0	0	0	0	0	6		
D7	0	0	0	0	0	0	0	0	0	0	7		
D8	0	0	0	0	0	0	0	0	0	0	8		
D9	0	0	0	0	0	0	0	0	0	0	9		
DA	0	0	0	0	0	0	0	0	0	0	10		
DB	0	0	0	0	0	0	0	0	0	0	11		
DC	0	0	0	0	0	0	0	0	0	0	12		
DD	0	0	0	0	0	0	0	0	0	0	13		
DE	0	0	0	0	0	0	0	0	0	0	14		
DF	0	0	0	0	0	0	0	0	0	0	15		
E0	0	1	0	0	0	1	0	0	1	1	0	Aj	GROUP 7
E1	0	1	0	0	0	1	0	0	1	1	1		
E2	0	1	0	0	0	1	0	0	1	1	2		
E3	0	1	0	0	0	1	0	0	1	1	3		
E4	0	1	0	0	1	0	0	1	1	0	4		
E5	0	1	0	0	1	0	0	1	1	0	5		
E6	0	1	0	0	1	0	0	1	1	0	6		
E7	1	0	1	1	1	1	1	1	1	1	7		
E8	1	0	1	1	1	1	1	1	1	1	8		
E9	1	0	1	1	1	1	1	1	1	1	9		
EA	0	1	0	0	0	0	1	0	0	0	10		
EB	0	1	0	0	0	0	1	0	0	0	11		
EC	1	0	1	1	1	1	1	1	1	1	12		
ED	1	0	1	1	1	1	1	1	1	1	13		
EE	1	0	1	1	1	1	1	1	1	1	14		
EF	1	0	1	1	1	1	1	1	1	1	15		
F0	0	0	0	0	0	0	0	0	0	0	0	Ak	
F1	0	0	0	0	0	0	0	0	0	0	1		
F2	0	0	0	0	0	0	0	0	0	0	2		
F3	0	0	0	0	0	0	0	0	0	0	3		
F4	0	0	0	0	0	0	0	0	0	0	4		
F5	0	0	0	0	0	0	0	0	0	0	5		
F6	0	0	0	0	0	0	0	0	0	0	6		
F7	0	0	0	0	0	0	0	0	0	0	7		
F8	0	0	0	0	0	0	0	0	0	0	8		
F9	0	0	0	0	0	0	0	0	0	0	9		
FA	0	0	0	0	0	0	0	0	0	0	10		
FB	0	0	0	0	0	0	0	0	0	0	11		
FC	0	0	0	0	0	0	0	0	0	0	12		
FD	0	0	0	0	0	0	0	0	0	0	13		
FE	0	0	0	0	0	0	0	0	0	0	14		
FF	0	0	0	0	0	0	0	0	0	0	15		

GROUP 0-SUM, DIFFERENCE, PRODUCT, QUOTIENT, COMPARE NUMERIC, SCALE, SCALE ROUNDED
GROUP 1-NOT USED
GROUP 2-MOVE NUMERIC
GROUP 3-EDIT
GROUP 4-IMMEDIATE, j=0
GROUP 5-IMMEDIATE, j=1
GROUP 6-IMMEDIATE, j=2&3, BYTE MOVE, COMPARE, COMPARE COLLATED, SCAN, TRANSLATE
GROUP 7-CALCULATE SUBSCRIPT

Figure 2-9. BDP Instruction Specification Error RAM (Sheet 2 of 2)

PREVENTIVE MAINTENANCE

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The preventive maintenance procedures are from a computer automated maintenance scheduling (CAMS) listing provided by Engineering Services.

Procedure Number	Procedure Description
5001	CYBER 845S, 855S, 840A, 850A, and 860A Memory Maintenance Strategy
5002	Processor 4.5-V Voltage Margins - Plus-
5003	Processor 2.7-V Voltage Margins - Plus-
5004	Processor Clock Width Margins -Wide-
5005	Processor Clock Pulse Width Margins - Narrow-
5006	Processor Clock Frequency Margins - Fast-
5007	Processor Clock Frequency Margins - Slow-
5008	Temp Protect Fault Check
5012	Memory Voltage Margins +5 Percent
5013	Memory Voltage Margins -5 Percent
5018	Memory Voltage Margins 5 Percent Splits
5022	IOU Voltage Margins +5 Percent
5023	IOU Voltage Margins -5 Percent
5024	IOU Clock Pulse Width -Wide-
5025	IOU Clock Pulse Width -Narrow-
5026	IOU Clock Frequency Margins -Fast-
5027	IOU Clock Frequency Margins -Slow-
5028	IOU Voltage Margins 2.5 Percent Splits
5101	Monthly Checks
5102	Monthly Checks
5103	Maintenance Gauge Calibration Check
5202	Voltmeter Calibration Check
5301	Mechanical Inspection
5401	Memory and IOU Warning System Check
5402	Processor 4.5-V Voltage Margins -Minus-
5403	Processor 2.7-V Voltage Margins -Minus-
5440	Yearly Test Group 1 - MIGDS
5441	Yearly Test Group 2 - MIGDS
5442	Yearly Test Group 3 - A170
5443	Remote Technical Assistance Verification
5535	GH251-2 Cooling System Unit
6000	General Installation Instructions
6001	QSA General Instructions
6002	Field Transfer General Instructions

5001 CY840/850/860 MEMORY MAINTENANCE STRATEGY

```
*
*  ALL DOUBLE/MULTIPLE BIT FAILURES WILL BE REPAIRED.
*
```

5002 4.5V VOLTAGE MARGINS - PLUS - CPU

```
* RUN MI 5101 PRIOR TO USING METERS FOR VOLTAGE MARGINS.
*
* ADJUST THE FOLLOWING VOLTAGES +5 PERCENT ON THE CPU CABINET:
* COL. 1 - 4.7 VOLT
* COL. 2 - 4.7 VOLT
* COL. 3 - 4.7 VOLT
*
* RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER RUNS THE MODEL
* DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
* THAT TESTS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
* BY THE RELEASED XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES THE
* PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS THE MODEL
* INDEPENDENT TESTS (FCT,RCT,ETC.).
*
* ADJUST THE VOLTAGES TO NORMAL.
*
```

5003 2.7V VOLTAGE MARGINS - PLUS - CPU

```
* RUN MI 5101 PRIOR TO USING METERS FOR VOLTAGE MARGINS.
*
* ADJUST THE FOLLOWING VOLTAGES +5 PERCENT ON THE CPU CABINET:
* COL. 1 - 2.2 VOLT
* COL. 2 - 2.7 VOLT
* COL. 3 - 2.7 VOLT
*
* RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER RUNS THE MODEL
* DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
* THAT TESTS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
* BY THE RELEASED XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES THE
* PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS THE MODEL
* INDEPENDENT TESTS (FCT, RCT, ETC.).
*
* ADJUST THE VOLTAGES TO NORMAL.
```

```
        *

5004        CLOCK WIDTH MARGINS - WIDE - CPU

        *
        * RUN COMMANC BUFFER ALLMD3W - THIS COMMAND BUFFER RUNS THE
        * MODEL DEPENDENT XXT3 TESTS AT WIDE MARGINS.
        *
        * SELECT WIDE MARGINS BY TYPING CM,2,S  (CR).
        * RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
        * THAT RUNS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
        * BY THE RELEASED XXT3 TESTS.
        * CLEAR WIDE MARGINS BY TYPING CM,2, (CR)
        *
        * RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
        * THE PROCESSOR AND LOADS THE MICROCODE.
        *
        * RUN COMMAND BUFFER ALLMI3W - THIS COMMAND BUFFER RUNS THE
        * MODEL INDEPENDENT TESTS AT WIDE MARGINS.
        *


5005        CLOCK PULSE WIDTH MARGINS - NARROW - CPU

        *
        * RUN COMMAND BUFFER ALLMD3N - THIS COMMAND BUFFER RUNS THE
        * MODEL DEPENDENT XXT3 TESTS AT NARROW MARGINS.
        *
        * SELECT NARROW MARGIN BY TYPING CM,2,F  (CR).
        * RUN COMMANC BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
        * THAT RUNS AREAS OF THE PROCESSOR THAT ARE NOT TESTED BY
        * THE RELEASED XXT3 TESTS.
        * CLEAR NARROW MARGIN BY TYPING CM,2,  (CR)
        *
        * RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
        * THE PROCESSOR ANC LOADS THE MICROCODE.
        *
        * RUN COMMAND BUFFER ALLMI3N - THIS COMMAND BUFFER RUNS THE
        * MODEL INDEPENDENT TEST, AT NARROW MARGINS.
        *


5006        CLOCK FREQUENCY MARGINS - FAST - CPU

        *
        * WARNING..... CHANGING CLOCK FREQUENCY AFFECTS THE CLOCK
        *              GOING TO SEVERAL EQUIPMENTS IN THE SYSTEM.
        *
        * THE CLOCK FREQUENCY SELECT SWITCH IS ON THE MASTER OSCILLATOR
        * BOARD LOCATED AT A14 IN THE MEMORY UNIT.  THE FAST/SLOW
        * SWITCH IS THE TOP SWITCH ON THIS BOARD.
        *
        * SET THE FREQUENCY SELECT SWITCH TO THE UP POSITION. (FAST)
        *
        * RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER RUNS
* THE MODEL DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
* THAT TESTS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
* BY THE RELEASED XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
* THE PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS THE
* MODEL INDEPENDENT TESTS (FCT, RCT, ETC.).
*
* SET FREQUENCY SELECT SWITCH TO THE CENTER POSITION. (NORMAL)
*
```

5007 CLOCK FREQUENCY MARGINS - SLOW - CPU

```
*
* WARNING..... CHANGING CLOCK FREQUENCY AFFECTS THE CLOCK
*              GOING TO SEVERAL EQUIPMENTS IN THE SYSTEM.
*
* THE CLOCK FREQUENCY SELECT SWITCH IS ON THE MASTER OSCILLATOR
* BOARD LOCATED AT A14 IN THE MEMORY UNIT.  THE FAST/SLOW
* SWITCH IS THE TOP SWITCH ON THIS BOARD.
*
* SET THE FREQUENCY SELECT SWITCH TO THE DOWN POSITION. (SLOW)
*
* RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER RUNS
* THE MODEL DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
* THAT TESTS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
* BY THE RELEASED XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
* THE PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS
* THE MODEL INDEPENDENT TESTS (FCT, RCT, ETC.).
*
* SET FREQUENCY SELECT SWITCH TO THE CENTER POSITION. (NORMAL)
*
```

5008 TEMP PROTECT FAULT CHECK

```
*
* PER CPU PANEL (ZIP OR LSI)
*
* GENERAL INFORMATION:
*
* EACH TEMP PROTECT BOARD HAS TEN THERMISTOR INPUTS - 5 ARE
* PRIMARY FAULT DETECTORS, AND 5 ARE BACK UP FAULT DETECTORS.
*
* A PRIMARY FAULT OCCURS WHEN THE PRIMARY THERMISTOR DETECTS
* A TEMPERATURE OF 92 DEGREES F OR MORE (LSI).
* (ZIF 37 DEG. C - 98 DEG. F)
*
* A BACK-UP FAULT OCCURS WHEN THE BACK-UP THERMISTOR DETECTS
* A TEMPERATURE OF 104 DEGREES F OR MORE (LSI).
* (ZIF 45 DEG. C - 113 DEG. F)
*
* NORMAL CHASSIS TEMPERATURE IS 62 (+3/-0) DEGREES.
*
* A PRIMARY TEMP FAULT MUST EXIST FOR 10 SEC OR MORE BEFORE IT
* SHUTS OFF DC POWER TO COLUMN VIA CONTACTOR IN P.D. BOX.
* IF THE FAULT EXISTS FOR 10 SEC OR MORE, THE FAULT INDICATION
* IS LATCHED ON THE TEMP PROTECT BOARD THAT SENSED THE FAULT,
* AND ALSO LATCHED ON THE POWER CONTROL BOARD.
*
* IF THE PRIMARY FAULT EXISTS FOR LESS THAN 10 SEC, IT WILL NOT
* POWER DOWN THE CABINET AND IT WILL NOT BE LATCHED ON THE TEMP
* PROTECT BOARD OR ON THE POWER CONTROL BOARD.
*
* A BACK-UP FAULT SHUTS OFF POWER AFTER 2.5 SEC. IT DOES THIS BY
* TRIPPING THE 2.2/2.7V AND 4.7V C.B.. THE FAULT INDICATOR WILL
* BE LATCHED ON THE TEMP PROTECT BOARD THAT DETECTED THE FAULT
* AND IT WILL ALSO BE LATCHED BY THE POWER CONTROL BOARD.
* (150 DEG. THERMOSTAT ON HEAT SINK WILL TRIP THE MAIN C.B.).
*
* PRIMARY TEMP FAULT SHUT/DOWN CHECK
*
* NOTE:  IN THE FOLLOWING STEPS, THE TERMISTOR
* CONNECTOR ON A TEMP PROTECT BOARD WILL BE PARTIALLY
* UNPLUGGED TO SIMULATE A "PRIMARY HI TEMP" FAULT CONDITION.
* THE CONNECTOR IS LAID OUT SO THAT THE 5 INPUTS NEAREST
* YOU ON THE PLUG ARE PRIMARY THERMISTOR INPUTS, AND THE
* 5 INPUTS TOWARDS THE REAR OF THE CONNECTOR ARE BACK-UP
* THERMISTOR INPUTS.
*
* - SEE SERVICE BULLETIN 6092 (THERMISTOR TESTING METHODS) -
*
* CHECK THE PRIMARY FAULT SHUTDOWN IN THE FOLLOWING MANNER:
*
* 1. INSURE CABINET IS IN START CONDITION.
* 2. SIMULATE A "PRIMARY HI TEMP" FAULT BY PARTIALLY
*    DISCONNECTING THE THERMISTOR CONNECTOR ON PANEL C1
*    (OPEN THE CONNECTOR PINS NEAREST YOU AND OBSERVE
*    PRIMARY FAULT (ALL 5) LEDS ON TEMP PROTECT BOARD).
* 3. INSURE THAT APPROX 12 SECONDS AFTER THE FAULT LEDS ENERGIZE,
*    THE COLUMN CONTACTOR OPENS AND DROPS DC LOGIC POWER.
* 4. RECONNECT THE CONNECTOR.
* 5. INSURE THE FAULT LEDS ON THE TEMP PROTECT
*    BOARD STAY ENERGIZED.
* 6. INSURE THE PRIMARY HI TEMP LED,IS "ON" ON THE
*    POWER CONTROL BOARD.
* 7. PRESS "RESET", ALL FAULT LEDS SHOULD CLEAR AND
*    COLUMN SHOULD POWER ON.
* 8. REPEAT THE ABOVE TEST ON PANELS C2 AND C3.
*
* BACK UP TEMP FAULT SHUT DOWN CHECK.
```

```
*
* NOTE: IN THE FOLLOWING STEPS, THE THERMISTOR CONNECTOR
* ON A TEMP PROTECT BOARD WILL BE PARTIALLY UNPLUGGED
* TO SIMULATE A "BACK UP HI TEMP" FAULT CONITION.
*
* THE CONNECTOR IS LAID OUT SO THAT THE 5 INPUTS NEAREST
* YOU ON THE PLUG ARE PRIMARY THERMISTOR INPUTS,
* AND THE 5 INPUTS TOWARDS THE REAR OF THE CONNECTOR
* ARE BACK-UP THERMISTOR INPUTS.
*
* CHECK THE BACK UP FAULT SHUTDOWN IN THE FOLLOWING MANNER:
*
* 1. INSURE THE CABINET IS POWERED ON.
* 2. SIMULATE A "BACK UP HI TEMP" FAULT BY PARTIALLY
*    DISCONNECTING THE THERMISTOR CONNECTOR ON PANNEL C1
*    (OPEN THE CONNECTOR PARTIALLY AND OBSERVE FAULT LEDS
*    ON THE TEMP PROTECT BOARD).
* 3. INSURE THAT APPROX 3 SECONDS AFTER A BACKUP LED LIGHTS
*    ON THE TEMP PROTECT BOARD, THE 400HZ DISCONNECT BREAKER
*    TRIPS, DROPPING BOTH 2V AND 4.7 BREAKERS.
* 4. RECONNECT THE CONNECTOR.
* 5. INSURE THE FAULT LEDS ON THE TEMP PROTECT BOARD
*    STAY ENERGIZED.
* 6. INSURE THE "BACKUP HI TEMP" LED AND "POWER SUPPLY
*    OFF" LED IS "ON" ON THE POWER CONTROL BOARD.
* 7. PRESS "RESET", RESET THE 400HZ BREAKER, PRESS RESET AGAIN
*    (POWER OFF INDICATOR SHOULD BE ON) THEN PRESS RESET AGAIN,
*    ALL FAULT LEDS SHOULD CLEAR AND THE SYSTEM SHOULD POWER ON.
* 8. REPEAT THE ABOVE TEST ON PANELS C2 AND D3.
```

5012 MEMORY VOLTAGE MARGINS +5 PERCENT

```
* NOTE:
* RUN MI 5101 PRIOR TO USING METERS FOR RUNNING VOLTAGE MARGINS.
*
* REFER TO MEMORY MAINTENANCE STRATEGY (MI 5001)
*
* ADJUST THE FOLLOWING VOLTAGES +5 PERCENT
*                 -5.2
*                 -2.7
*                 +5
* RUN ONE PASS OF CMT3 AND RUN MAT3 FOR ONE PASS OF TEST
* (5 - 15 MIN. DEPENDING ON MEMORY SIZE).
* THIS WILL TEST BOTH THE IOU AND PROCESSOR ACCESS TO MEMORY
*
* REPAIR SINGLE BIT FAILURES AS SPECIFIED BY MI5001.
*
* ADJUST VOLTAGES TO NORMAL
*
```

5013 MEMORY VOLTAGE MARGINS -5 PERCENT

```
* NOTE:
* RUN MI 5101 PRIOR TO USING METERS FOR RUNNING VOLTAGE MARGINS.
```

```
      *
      * REFER TO MEMORY MAINTENANCE STRATEGY (MI 5001)
      *
      * ADJUST THE FOLLOWING VOLTAGES -5 PERCENT
      *               -5.2
      *               -2.7
      *               +5
      * RUN ONE PASS OF CMT3 AND RUN MAT3 FOR ONE PASS OF TEST
      * (5 - 15 MIN. DEPENDING ON MEMORY SIZE).
      * THIS WILL TEST BOTH THE IOU AND PROCESSOR ACCESS TO MEMORY
      *
      * REPAIR SINGLE BIT FAILURES AS SPECIFIED BY MI5001.
      *
      * ADJUST VOLTAGES TO NORMAL
      *


5018      MEMORY VOLTAGE MARGINS 5 PERCENT SPLITS

      * NOTE:
      * RUN MI 5101 PRIOR TO USING METERS FOR RUNNING VOLTAGE MARGINS.
      *
      * BEFORE RUNNING VOLTAGE MARGINS, REPAIR SOLID BIT FAILURES
      * PER CAMS TASK MI5001.
      *
      * ADJUST VOLTAGES ON THE M3 AS FOLLOWS-
      *   -5.2V TO +5 PERCENT     +5 V TO +5 PERCENT
      *    2.7V TO -5 PERCENT
      *
      * RUN ONE PASS OF MAT3 FOR 5 - 15 MINUTES DEPENDING ON MEMORY SIZE.
      * THIS WILL TEST BOTH THE IOU AND PROCESSOR ACCESS TO MEMORY.
      *
      * ADJUST VOLTAGES ON THE M3 AS FOLLOWS:
      *   -5.2V TO -5 PERCENT     +5 V TO -5 PERCENT
      *    2.7V TO +5 PERCENT
      *
      * RUN DIAGNOSTICS AS DESCRIBED ABOVE.
      * ADJUST VOLTAGES TO NORMAL
      *


5022      IOU VOLTAGE MARGINS +5 PERCENT

      * NOTE:
      * RUN MI 5101 PRIOR TO USING METERS FOR RUNNING VOLTAGE MARGINS.
      *
      * ADJUST THE FOLLOWING VOLTAGES +5 PERCENT ON THE I2 CABINET-
      *           -2.2 VOLTS    -5.2 VOLTS
      *           +5 VOLTS
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS (EXTENCED DAED START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER FII30
      *
      * IF A CONSOLE (LOCAL OR REMOTE) IS USED ON THE TWO PORT
      * MUX, RUN ONE PASS OF TPM30.  THIS WILL REQUIRE AN OPERATOR
      * AT THE CONSOLE BEING TESTED.
      *
      * ADJUST ALL VOLTAGES TO NORMAL.
      *


5023        IOU VOLTAGE MARGINS -5 PERCENT

      * NOTE:
      * RUN MI 5101 PRIOR TO USING METERS FOR RUNNIN VOLTAGE MARGINS.
      *
      * ADJUST THE FOLLOWING VOLTAGES -5 PERCENT ON THE I2 CABINET-
      *           -2.2 VOLTS    -5.2 VOLTS
      *           +5 VOLTS
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS ( EXTENDED DEAD START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER FII30
      *
      * IF A CONSOLE (LOCAL OR REMOTE) IS USED ON THE TWO PORT
      * MUX, RUN ONE PASS OF TPM30.  THIS WILL REQUIRE AN OPERATOR
      * AT THE CONSOLE BEING TESTED.
      *
      * ADJUST ALL VOLTAGES TO NORMAL.
      *


5024        IOU CLOCK PULSE WIDTH - WIDE -

      *
      * SET I2 CLOCK PULSE WIDE BY TYPING APPROPRIATE PARAMETER.
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS (EXTENDED DEAD START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER TPM30 (IF CONSOLE
      * IS CONNECTED TO TWO PORT MUX)
      * RUN COMMAND BUFFER FII30W
      *
      * SET PULSE WIDTH TO NORMAL BY TYPING APPROPRIATE PARAMETER.
      *


5025        IOU CLOCK PULSE WIDTH - NARROW -

      *
      * SET I2 CLOCK PULSE NARROW BY TYPING APPROPRIATE PARAMETER.
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS ( EXTENDED DEAD START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER TPM30 ( IF CONSOLE
      * IS CONNECTED TO THE TWO PORT MUX)
      * RUN COMMAND BUFFER FII30N
      *
      * SET PULSE WIDTH TO NORMAL BY TYPING APPROPRIATE PARAMETER.
      *


5026       IOU CLOCK FREQUENCY MARGINS - FAST -

      *
      * I2 FREQUENCY MARGINS ARE SET VIA THE FREQUENCY
      * MARGIN SWITCH LOCATED ON THE DEADSTART PANEL.
      *
      * SET FREQUENCY MARGINS SWITCH TO FAST ON THE DEADSTART PANEL.
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS (EXTENDED DEAD START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER FII30
      *
      * IF A CONSOLE (LOCAL OR REMOTE) IS USED ON THE TWO PORT MUX,
      * RUN ONE PASS OF TPM30.  THIS WILL REQUIRE AN OPERATOR AT THE
      * CONSOLE BEING TESTED.
      *
      * SET FREQUENCY MARGINS SWITCH TO NORMAL ON THE DEADSTART PANEL.
      *


5027       IOU CLOCK FREQUENCY MARGINS - SLOW -

      *
      * I2 FREQUENCY MARGINS ARE SET VIA THE FREQUENCY
      * MARGIN SWITCH LOCATED ON THE DEADSTART PANEL.
      *
      * SET FREQUENCY MARGINS SWITCH TO SLOW ON THE DEADSTART PANEL.
      *
      * RUN LDS (LONG DEAD START)
      * RUN EDS (EXTENDED DEAD START)
      * RUN DST30 (DISPLAY CONSOLE TEST)
      * RUN COMMAND BUFFER FII30
      *
      * IF A CONSOLE (LOCAL OR REMOTE) IS USED ON THE TWO PORT MUX,
      * RUN ONE PASS OF TPM30.  THIS WILL REQUIRE AN OPERATOR AT THE
      * CONSOLE BEING TESTED.
      *
      * SET FREQUENCY MARGINS SWITCH TO NORMAL ON THE DEADSTART PANEL.
      *


5028       IOU VOLTAGE MARGINS 2.5 PERCENT SPLITS

      * NOTE:
      * RUN MI 5101 PRIOR TO USING METERS FOR RUNNING VOLTAGE MARGINS.
      *
      * ADJUST VOLTAGES ON THE I2 AS FOLLOWS: -2.2V TO -2.5 PERCENT
      *                                       -5.2V TO +2.5 PERCENT
      *                                       +5V   TO -2.5 PERCENT
      *
```

```
* RUN LDS (LONG DEAD START)
* RUN EDS ( EXTENDED DEAD START)
* RUN DST30 (DISPLAY CONSOLE TEST)
* RUN COMMAND BUFFER FII30
*
* IF A CONSOLE (LOCAL OR REMOTE) IS USED ON THE TWO PORT MUX,
* RUN ONE PASS OF TPM3C.  THIS WILL RECUIRE AN OPERATOR AT THE
* CONSOLE BEING TESTED.
*
* ADJUST VOLTAGES ON THE I2 AS FOLLOWS: -2.2V TO +2.5 PERCENT
*                                       -5.2V TO -2.5 PERCENT
*                                       +5V   TO +2.5 PERCENT
*
* RUN TESTS AS DESCRIBED ABOVE.
*
* ADJUST VOLTAGES TC NORMAL.
*
```

5101 MONTHLY CHECKS

```
* NOTE:  DO MI 5202 BEFORE DOING THIS PROCEDURE.
*
* THE LOGIC POWER SUPPLY ADJUSTMENTS AND TEST POINTS ARE LOCATED
* (CP = P.D. BOX)(MEMORY = VARIAC)(I2 = 400HZ PANEL) OF THE CPU,
* MEMORY AND IOU CABINETS, AND ON REGULATOR BOARDS LOCATED IN
* THE BACKPANEL AREA OF THE MEMORY AND IOU.
*
* VOLTAGES LOCATED ON 400 HZ POWER PANELS *
*
* USING THE ROTARY SELECT SWITCH, CHECK EACH VOLTAGE
* LEVEL FOR ZERO PERCENT ON THE METER. ADJUST ASSOCIATED
* VARIAC AS NEEDED.  REPEAT FOR EACH CABINET.
*
* VOLTAGES LOCATED ON REGULATOR BOARDS *
*
* MEMORY * CLOCK POWER SUPPLY VOLTAGES - USING A DIGITAL
* VOLTMETER. CHECK BETWEEN THE TCP AND CENTER TESTPOINTS
* FOR -2.2 VOLTS. ADJUST THE TOP POT AS NEEDED.
* CHECK BETWEEN THE BOTTOM AND CENTER TESTPOINTS FOR
* -5.2 VOLTS. ADJUST THE BOTTOM POT AS NEECED.
*
* IOU * +12 VOLTS AND - 12 VOLTS SUPPLIES - USING A DIGITAL
* VOLTMETER, CHECK BETWEEN THE TOP AND CENTER TESTPOINTS
* FOR -12 VOLTS.  ADJUST THE TOP POT AS NEEDED.
* CHECK BETWEEN THE BOTTOM AND CENTER TESTPOINTS FOR
* +12 VOLTS.  ADJUST THE BOTTOM POT AS NEECED.
*
```

5102 MONTHLY CHECKS

```
CHECK CONDENSER AND CHASSIS PRESSURE ---
*
THE CONDENSER AND CHASSIS PRESSURE GAUGES ARE LOCATED INSIDE THE
LEFT NARROW DOOR ON THE FRONT OF IOU CABINETS.
```

```
*
THE GAUGES INDICATE BOTH PRESSURE (BLACK NUMBERS) AND TEMPERATURE
(RED NUMBERS).
*
THE CONDENSER GAUGE SHOULD INDICATE 145 +5/-3 ON THE BLACK SCALE.
*
THE CHASSIS GAUGE SHOULD INDICATE 63 +/-2.1 ON THE BLACK SCALE.
*
IF EITHER OF THE GAUGES ARE OUTSIDE OF THE PROPER RANGE, REFER
TO THE COOLING MANUAL FOR CORRECTIVE PROCEDURES.
*
CHECK SIGHT GLASS COLOR DOT ---
*
THE SIGHT GLASS IS LOCATED BEHIND A CUTOUT IN THE LOWER PANEL
INSIDE THE LEFT NARROW DOOR ON THE FRONT OF THE CABINETS.   IT
MAY BE NECESSARY TO USE A FLASHLIGHT TO SEE THE COLOR DOT.
*
THE COLOR DOT SHOULD BE A DARK GREEN COLOR.
*
A YELLOW OR BLACK DOT INDICATES MOISTURE IN THE SYSTEM AND WILL
REQUIRE A FILTER DRYER REPLACEMENT. REFER TO THE COOLING
MANUAL FOR CORRECTIVE PROCEDURES.
```

5103 CHECK MAINTENANCE GAUGE CALIBRATION

```
* IN ORDER TO ENSURE THAT THE REFRIGERATION MAINTENANCE GAUGES
* IN THE IOU UNIT IS ACCURATE IT IS NECESSARY TO CALIBRATE
* AT LEAST ONCE EACH YEAR.
*
* CALIBRATION IS DONE THROUGH THE USE OF A HIGH PRECISION
* GAUGE THAT IS KEPT AT THE REGION/RESOURCE CENTER AS A
* SPECIAL REFRIGERATION TOOL.
*
* REFER TO THE COOLING MANUAL FOR DETAILED CALIBRATION PROCEDURES.
*
*  TOOLS AND TEST EQUIPMENT NEEDED:
*
*   12211612    CALIBRATION GAUGE (MARTIN DECKER)
*
```

5202 VOLTMETER CALIBRATION CHECK

```
* THE PERCENTAGE/VOLMETER IS LOCATED ON THE 400 HZ POWER PANEL
* ON THE LOWER LEFT SIDE OF THE FRONT OF THE CABINETS.  THE
* CALIBRATION ADJUSTMENTS ARE INSIDE THE 400 HZ PANEL MOUNTED
* ON THE BACK OF THE METER.
*
* THERE ARE THREE POTS ARANGED FROM LEFT TO RIGHT
* AS FOLLOWS:  -2.2/2.7, -5.2, +5 VOLTS.
* NOT ALL VOLTAGES ARE USED ON ALL CABINETS.
*
* STEP 1. CONNECT A DIGITAL VOLTMETER TO THE TEST
*         JACKS LOCATED BELOW THE ROTARY SELECT
*         SWITCH.
```

```
*
*       2. SELECT THE -2.2/2.7 VOLTAGE.
*
*       3. ADJUST THE VARIAC UNTIL THE DIGITAL VOLT-
*          METER READS -2.2 (-2.7 ON MEMORY).
*
*       4. ADJUST THE CALIBRATION POT UNTIL THE
*          PERCENTAGE METER READS ZERO PERCENT.
*
* REPEAT STEPS 2-4 FOR EACH OF THE OTHER VOLTAGES.
*
*  PROCESSOR CABINET
*
* THE PERCENTAGE/VOLTMETER IS LOCATED ON THE POWER DISTRIBUTION
* BOX AT BOTTOM OF EACH CHASSIS.
*
* THERE ARE TWO ADJUSTMENT POTS ON THE TOP REAR OF P.D.
* METER, FROM RIGHT TO LEFT (FRONT VIEW). THEY ARE -
*   -2.7V
*   -4.7V
*
* REPLACED FOR EACH COLUMN
*
* STEP  1.   SEE INSTALLATION MANUAL (PUB. NO. 60461620).
*             FOR PROPER PROCEDURES USED TO CONNECT VOLTMETER
*             TO LOGIC BOARDS.
*       2.   SELECT -2.2V COL. 1
*       3.   ADJUST THE 2.2V COL. 1 VARIAC UNTIL THE
*            DIGITAL VOLTMETER READS -2.2 VOLTS.
*       4.   ADJUST THE RIGHTMOST (FRONT VIEW) CALIBRATION POT
*            IF NECESSARY TO SET THE PERCENTAGE METER TO ZERO.
*       5.   SELECT -2.7 COL. 2/3
*       6.   ADJUST THE 2.7 VARIAC UNTIL THE DIGITAL
*            VOLTMETER READS -2.7 VOLTS.
*       7.   ADJUST THE CENTER POT IF NECESSARY TO SET THE
*            PERCENTAGE METER TO ZERO.
*       8.   SELECT -4.7 COL. 1
*       9.   ADJUST THE 4.7 COL. 1 VARIAC UNTIL THE DIGITAL
*            VOLTMETER READS -4.7 VOLTS.
*      10.   ADJUST THE LEFT POT IF NECESSARY TO SET THE
*            PERCENTAGE TO ZERO.
*
*  TOOLS AND TEST EQUIPMENT NEEDED:
*
*   12263279    DIGITAL VOLTMETER
*
```

5301 MECHANICAL INSPECTION

```
THE PURPOSE OF A MECHANICAL INSPECTION IS TO INSURE THAT THE UNIT
IS MECHANICALLY SOUND AND ITS APPEARANCE IS MAINTAINED TO A GOOD
AS NEW LEVEL.
*      CAUTION - USE CAUTION WHEN WORKING IN THE BACKPANEL
*                AREA.  POWER BUS AND COMPONENTS MAY BE EXPOSED.
*
```

THE INSPECTION SHOULD INCLUDE THE FOLLOWING ITEMS -

- DOORS CLOSING PROPERLY
- LOOSE OR MISSING SCREWS ON PANELS AND SKINS
- CHIPPED OR SCRATCHED PAINT
- NOISY BEARING ON BLOWERS
- LOOSE CABLE CONNECTORS
- LOOSE CONNECTOR BLOCKS ON BACKPANEL PINS
- OVERSTRESSED CABLE WIRES
- CHECK FOR LOOSE LATCHES ON DOORS
- CHECK FOR MISSING SAFETY COVERS
- CHECK DOORS FOR FRAYED OR BROKEN MESH GASKET MATERIAL
- OR PEELING COPPER TAPE
- LOOSE POWER CONNECTIONS (HOT SPOTS) ON THE DEADSTART PANEL
- -SEE SERVICE BULLETIN 6088 (LOOSE CONNECTIONS ON 400HZ PANEL).

*

CORRECT ANY OF THE ABOVE OR OTHER PROBLEMS FOUND DURING THE INSPECTION.

*
* TOOLS AND TEST EQUIPMENT NEEDED:
*
* TOUCH UP PAINT
*

5401 CHECK WARNING SYSTEMS (MEMORY AND IOU)

PROTECTION AGAINST CATASTROPHIC FAILURES IS PROVIDED BY THE VARIOUS WARNING SENSORS IN THE M3 AND I2 CABINETS. FOR OBVIOUS REASONS IT IS ESSENTIAL THAT THESE SENSORS BE TESTED ON A REGULAR BASIS

*

SMOKE DETECTORS - TWO PEOPLE ARE REQUIRED FOR THIS PROCEDURE.

*
* THERE ARE FOUR SMOKE DETECTORS IN IOU CABINET.
* THEY ARE LOCATED AT THE REAR TOP OF THE CABINET, ONE
* ON EACH SIDE OF THE UPPER BLOWER HOUSING.
*
* TEST AT LEAST ONE SMOKE DETECTOR ON EACH COLUMN.
*

HIGH TEMPERATURE WARNING AND FAULT SENORS

*
* S1 - HIGH TEMP WARNING 95 DEGREES F.
* S2 - HIGH TEMP BACKUP 130 DEGREES F.
* S3 - HIGH TEMP FAULT 110 DEGREES F.
*
* THE SENSORS ARE LOCATED BEHIND PLASTIC COVERS ON THE UPPER
* RIGHT HAND CORNER OF THE BACKPANEL.
*
* **** WARNING ****
*
* THE SENSORS ARE LOCATED NEAR BUS BAR AND OTHER "HOT" COMPONNENTS.
* (IOU ONLY) USE CAUTION WHEN WORKING IN THIS AREA.
*
* 1. REMOVE PROTECTIVE COVER. LOOSEN MOUNTING SCREWS OF SENSOR
*
* 2. CAREFULLY HEAT HIGH TEMPERATURE FAULT SENSORS (S3)
* WITH HEAT GUN (P/N 12262503). THE TEMPERATURE FAULT LED

```
*     ON THE 50/60 HZ POWER PANEL LIGHTS AND UNIT POWERS DOWN
*     WHEN HIGH TEMP FAULT SENSOR REACHES 110 DEFREES F.
*
* 3.  ALLOW THE SENSOR TO COOL, SPRAY COOLANT MAY BE USED TO
*     COOL THE SENSOR.
*
* 4.  REPEAT STEPS 2 AND 3 FOR THE HIGH TEMP BACKUP SENSOR
*     (S2).  THE UNIT WILL POWER DOWN BY TRIPPING THE 400 HZ
*     CIRCUIT BREAKERS, BUT NO FAULT INDICATORS WILL LIGHT.
*
* 5.  STEPS 1 THRU 4 MUST BE DONE ON THE IOU CABINET.
*
LOW TEMPERATURE FAULT
*
* THE LOW TEMPERATURE SENSOR IS LOCATED ON THE COPPER TUBING
* IN THE LOWER LEFT (FROM THE REAR) EDGE OF THE BACKPANEL.
* IT MAY BE NECESSARY TO REMOVE THE PLASTIC PROTECTIVE COVER
* TO ACCESS THE LOW TEMPERATURE FAULT SENSOR.
*
* **** WARNING ****
*
* THERE ARE POWER BUS BARS IN THE AREA.  USE CAUTION WHEN
* WORKING IN THIS AREA.
*
* 1.  USING AEROSOL COOLANT (P/N 12263292), SPRAY THE COPPER
*     TUBE AT THE POINT WHERE THE LOW TEMP SENSOR IS CONNECTED.
*     AFTER A TWO (2) MINUTE DELAY,
*     THE LOW TEMP FAULT LED ON THE 50/60 HZ POWER CONTROL
*     PANEL LIGHT AND THE IOU CABINET POWERS DOWN.
*
* 2.  ALLOW SEVERAL MINUTES FOR THE SENSOR TO WARM UP BEFORE
*     BRINGING UP POWER.  IT MAY BE NECESSARY TO GRASP THE
*     TUBE WITH YOUR HAND TO WARM IT.
*
* 3.  STEPS 1 AND 2 MUST BE DONE ON BOTH THE MEMORY AND IOU
*     CABINETS.
*
*
BLOWER FAULT 1 AND 2 - TWO PEOPLE REQUIRED
*
* THE AIR FLOW SENSOR TEST SWITCH IS LOCATED BELOW THE
* CONTROL RESET SWITCH ON THE 50/60 HZ POWER CONTROL PANEL.
* THE TEST SWITCH IS SPRING LOADED AND MUST BE HELD DOWN
* WHILE CHECKING THE AIR FLOW SENSOR.
*
* 1.  PRESS AND HOLD DOWN THE AIR FLOW SENSOR TEST SWITCH.
*     THE BLOWERS WILL STOP AND STAY OFF AS LONG AS THE
*     SWITCH IS HELD DOWN.  AFTER APPROXIMATELY 2 MINUTES
*     BLOWER 1 OR BLOWER 2 FAULT LED WILL LIGHT AND THE UNIT
*     WILL POWER DOWN IN 2.5 SEC.
*
* 2.  DETERMINE WHICH SENSOR CAUSED THE FAULT (SENSOR 1 IS
*     ON THE RIGHT).
*
* 3.  AFTER THE SENSOR HAS COOLED (SPRAY COOLANT MAY BE USED),
*     PRESS POWER ON SWITCH TO RESTART THE UNIT.  THE FAULT
*      LED"S GO OFF WHEN THE POWER ON SWITCH IS PRESSED.
*
* 4.   TO TEST THE OTHER SENSOR PRESS AND HOLD THE TEST SWITCH
*      DOWN AGAIN.  EVERY 30 SECONDS SPRAY SOME COOLANT ON THE
*      SENSOR THAT CAUSED THE FIRST FAULT.  (THIS WILL REQUIRE
*      A SECOND PERSON, AS THE TEST SWITCH MUST ALSO BE HELD
*      DOWN).  THE OTHER BLOWER FAULT LED SHOULD COME ON IN
*      APPROXIMATELY 2 MINUTES.
*
* 5.   AFTER THE SENSOR HAS COOLED (SPRAY COOLANT MAY BE USED),
*      PRESS POWER ON SWITCH TO RESTART THE UNIT.
*
* 6.   STEPS 1 THRU 5 MUST BE DONE ON BOTH THE MEMORY
*      AND IOU CABINETS.
*
CONDENSER FAULT  (IOU - I2 ONLY)
*
* A CONDENSING UNIT FAULT RESULTS WHEN CONDENSER PRESSURE
* EXCEEDS THE PRESET CUTOUT POINT OF 190 PSI.  TO ADJUST THIS
* CUTOUT POINT, USE THE ADJUSTMENT SCREW ON TOP OF THE DUAL
* PRESSURE CONTROL SWITCH.  THE PRESSURE CAN BE MONITORED
* ON THE CONDENSER PRESSURE GAUGE LOCATED ON THE CONDENSING UNIT.
*
* 1.   TURN OFF COOLING WATER SUPPLY VALVE (NORMALLY LOCATED
*      UNDER THE FLOOR NEAR THE CONDENSING UNIT).  PRESSURE
*      WILL INCREASE UNTIL IT REACHES 190 PSI AND THEN THE
*      CONDENSER FAULT LED LIGHTS AND THE UNIT POWERS DOWN.
*      IF THE UNIT DOES NOT POWER DOWN, OPEN THE WATER SUPPLY
*      VALVE AND REFER TO THE COOLING MANUAL FOR ADJUSTMENT
*      PROCEDURES.
*
* 2.   OPEN WATER SUPPLY VALVE.
*
* 3.   PRESS MANUAL RESET LEVER ON TOP OF THE DUAL PRESSURE
*      SWITCH.  (IT MAY BE NECESSARY TO PRESS LEVER SEVERAL
*      TIMES BEFORE IT STAYS DOWN).
*
*
* 4.   POWER UP THE UNIT.  FAULT LED GOES OFF WHEN
*      POWER ON SWITCH IS PRESSED.
*
SYSTEM POWER MONITOR
*
DEW POINT WARNING AND FAULT
* THE DEW POINT SENSOR IS LOCATED ON THE WALL MOUNTED
* POWER MONITOR PANEL
*
*   PANEL SELECT        SHUT DOWN          WARNING
*   -------------------------------------------------------------
*      SELECT           56 DEG. DEW        52 DEG. DEW
*                       96 REG. HUMIDITY   LESS THAN 20% OR
*                                          GREATER THAN 70% HUMIDITY
*                       104 DEG. F         LESS THAN 54 DEG. F OR
*                                          GREATER THAN 90% F
*     PWR SUPPLY VOLTS                     + OR -10%
*   -------------------------------------------------------------
```

5402 4.5V VOLTAGE MARGINS - MINUS - CPU

```
* ADJUST THE FOLLOWING VOLTAGES -5 PERCENT ON THE P3 CABINET:
* COL. 1 - 4.7 VOLT
* COL. 2 - 4.7 VOLT
* COL. 3 - 4.7 VOLT
*
* RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER
* RUNS THE MODEL DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER CSM - THIS IS AN INTERIM COMMAND BUFFER
* THAT TESTS AREAS OF THE PROCESSOR THAT ARE NOT TESTED
* BY THE RELEASED XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
* THE PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS
* THE MODEL INDEPENDENT TESTS (FCT, RCT, ETC.).
*
* ADJUST THE VOLTAGES TO NORMAL.
*
```

5403 2.7V VOLTAGE MARGINS - MINUS - CPU

```
* ADJUST THE FOLLOWING VOLTAGES -5 PERCENT ON THE P3 CABINET:
* COL. 1 - 2.7 VOLT
* COL. 2 - 2.7 VOLT
* COL. 3 - 2.7 VOLT
*
* RUN COMMAND BUFFER ALLMD3 - THIS COMMAND BUFFER RUNS
* THE MODEL DEPENDENT XXT3 TESTS.
*
* RUN COMMAND BUFFER INITP3 - THIS COMMAND BUFFER INITIALIZES
* THE PROCESSOR AND LOADS THE MICROCODE.
*
* RUN COMMAND BUFFER ALLMI3 - THIS COMMAND BUFFER RUNS THE
* MODEL INDEPENDENT TESTS (FCT, RCT, ETC.).
*
```

5440 YEARLY TEST GROUP 1 - MIGDS

```
* THERE ARE A NUMBER OF PARAMETER SELECTIONS THAT ARE COMMON
* TO MOST OF THE MIGDS TESTS (XXXXOPT).  THE PARAMETER
* QUESTIONS AND THE RECOMMENDED RESPONSES ABE LISTED BELOW:
*
*  DO YOU WANT TO SEE THE DESCRIPTION OF THE BUFFERS? - N
*  BYPASS OPTIONS? - N
*  RUN WITH PAGE FAULTS? - Y
*  RUN WITH MAP PURGES? - Y
*  RUN WITH CACHE PURGES? - Y
*  RUN WITH LIMITED WORKING SET SIZE? - Y
*  NUMBER OF PAGES. - SEE INDIVIDUAL TESTS
*  ARE TRAPS IMPLEMENTED? - Y
```

```
        *  RUN WITH SMALL PIT? - Y
        *  ENTER PIT VALUE. - (CR)
        *  RUN WITH SMALL SIT? - Y
        *  ENTER SIT VALUE. - (CR)
        *  ENTER STARTING PASS COUNT. - (CR)
        *  RUN ALL TEST? - Y
        *  RUN SELECTED J VALUES? - N
        *  RUN SELECTED DATA TYPES? - N
        *  PASSES TO RUN. - SEE INDIVIDUAL TESTS
        *  PURGE MAP BEFORE EACH TEST? - Y
        *  DEFAULT PADD? - Y
        *  DO YOU WANT TO RUN ALL OPERATIONS? - Y
        *  USE RANDOM DATA ONLY? - N
        *
        * RUN THE FOLLOWING TESTS USING THE INDICATED
        * NUMBER OF PASSES OR TIMES.
        *
        *  TEST NAME     PASSES         TIME
        *  ---------     ------         -----
        *  BIMM          10             1 MIN.
        *  BRCH           5             1
        *  BYTE           1             1
        *  CRPT          10             1
        *  DCBL           2             1
        *  FIMM           5             5
        *  FINT           4             5
        *  HIMM           5             5
        *  HINT           4             5
        *  PAGE          20             1
        *  RCT2           -             1
        *  RNGT          15             1
        *  RCFS           -             1
        *  SNGL           2             1
        *  STAT          60             1
        *  TASE          20             1
        *  TIVE          30             1
        *  ECIT           4             5
        *  NUMR           4             40
        *  DUAL           4             5
        *

5441       YEARLY TEST GROUP 2 - MIGDS

        * THERE ARE A NUMBER OF PARAMETER SELECTIONS THAT ARE COMMON
        * TO MOST OF THE MIGDS TESTS (XXXXOPT).  THE PARAMETER QUESTIONS
        * AND THE RECOMMENDED RESPONSES ARE LISTED BELOW:
        *
        *  DO YOU WANT TO SEE THE DESCRIPTION OF THE BUFFERS? - N
        *  BYPASS OPTION? - N
        *  RUN WITH PAGE FAULTS? - Y
        *  RUN WITH MAP PURGES? - Y
        *  RUN WITH CACHE PURGES? - Y
        *  RUN WITH LIMITED WORKING SET SIZE? - Y
        *  NUMBER OF PAGES. - SEE INDIVIDUAL TESTS
        *  ARE TRAP IMPLEMENTED? - Y
*  RUN WITH SMALL PIT? - Y
*  ENTER PIT VALUE. - (CR)
*  RUN WITH SMALL SIT? - Y
*  ENTER SIT VALUE. - (CR)
*  ENTER STARTING PASS COUNT. - (CR)
*  RUN ALL TESTS? - Y
*  RUN SELECTED J VALUES? - N
*  RUN SELECTED DATA TYPES? - N
*  PASSES TO RUN. - SEE INDIVIDUAL TESTS
*  PURGE MAP BEFORE EACH RUN? - Y
*  DEFAULT PADD? - Y
*  DO YOU WANT TO RUN ALL OPERATIONS? - Y
*  USE RANDOM DATA ONLY? - N
*
* RUN THE FOLLOWING TEST USING THE INDICATED
* NUMBER OF PASSES OR TIMES
*  TEST NAME    PASSES        TIMES
*  ---------    ------        -----
*  NUMR         1             40 MIN.
```

5442 YEARLY GROUP 3 - A170

```
* RUN THE FOLLOWING A170 TESTS FOR 5 MINUTES EACH:
*
* EXC3 - IMC,BGK,FCT  WITH CMC IN AT LEAST 2 PPS
* EXC3 - RTJ,FM2,LAT
* EXC3 - EJP,CM6,PCP
*
```

5443 REMOTE TECHNICAL ASSISTANCE VERIFICATION

PROCEDURES FOR RS232 AND CCITT

CAUTION

DO NOT PERFORM THIS PROCEDURE WITHOUT CUSTOMER APPROVAL. CONTACT THE BRANCH MANAGER TO VERIFY THAT THE CUSTOMER HAS AGREED TO THE USE OF RTA ON THE AFFECTED COMPUTER SYSTEM.

THIS PROCEDURE IS DIVIDED INTO TWO CATAGORIES. ONE CATAGORY IS FOR COMPUTER SITES IN COUNTRIES WHERE RS232 IS THE TELECOMMUNICATIONS STANDARD, E.G. UNITED STATES, CANADA. THE OTHER IS FOR SITES IN COUNTRIES WHERE CCITT IS THE STANDARD, E.G. WEST GERMANY, AUSTRALIA. USE THE APPLICABLE CATAGORY TO VERIFY YOUR RTA CAPABILITY, USING A CONVENIENT SERVICE FACILITY, E.G. SERVICE CENTER, COUNTRY/REGIONAL TECHNICAL SUPPORT CENTER.

NOTE

DUE TO PROBLEMS INVOLVING INCOMPATABLE TELEPHONE SYSTEMS AND GOVERNMENT REGULATIONS, INTERNATIONAL RTA PROCEDURES MAY VERY. IF PROBLEMS ARE ENCOUNTERED, A MODIFIED PROCEDURE MUST BE ESTABLISHED BY THE LOCAL TECHNICAL SUPPORT ORGANIZATION.

THIS PROCEDURE REQUIRES:

```
************RS232****************************CCITT**************
```

```
*                                *                                 *
*- COUPLER CABLE (P/N 62032601)  *- COUPLER CABLE (P/N 62032601)) *
*                                *                                 *
*- NOVATION CAT ACOUSTIC COUPLER *- LOCALLY PURCHASED COUPLER WITH*
*  (P/N 12263509) OR EQUIVALENT  *  A. CCITT V.21 OR V.24 STANDARD*
*                                *  B. 300 BAUD RATE               *
*                                *  C. TRANSMIT FREQ 1650-1850 HZ *
*                                *  D. RECEIVE  FREQ  980-1180 HZ *
*******************************************************************
```

THIS PROCEDURE ASSUMES:

- RTD (MSL 15X) IS INSTALLED ON THE SYSTEM DISK

- PERSON PERFORMING THIS PROCEDURE IS FAMILIAR WITH RTA AND MSL.

1. VERIFY THAT THE ACOUSTIC COUPLER IS CONNECTED TO TERMINAL 0 ON THE I/O CONNECTOR PANEL.
2. VERIFY THAT THE COUPLER IS POWERED ON.
3. VERIFY THAT THE SWITCHES ON THE COUPLER ARE SET TO:

```
***********RS232**************************CCITT********************
*                                *                                 *
* - F/H TO F  (FULL/HALF)        * - F/H TO F  (FULL/HALF)         *
*                                *                                 *
* - O/A TO A  (ORIGINATE/ANSWER) * - O/A TO A  (ORIGINATE/ANSWER) *
*                                * - AC/DAA TO AC (ACOUSTIC COUP- *
*                                *   LER/DIRECT ACOUSTIC ACCESS)  *
*                                *                                 *
*******************************************************************
```

**NOTE (CCITT ONLY) **

SOME ACOUSTIC COUPLERS DO NOT HAVE ALL OF THESE SWITCHES AND/OR NOMENCLATURE ON THE SWITCHES MAY VARY.

4. VERIFY THE TERMINAL 0 PORT SWITCHES IN THE IOU CABINET AT LOCATION 001 (7WFO PAK) ARE SET TO 300 BAUD.
   A. SWITCH 1 TO OFF (0)
   B. SWITCH 2 TO ON (1)
   C. SWITCH 3 TO OFF (0)

5. LOAD RTD, SET THE PARAMETERS "LT,RTD,,1500,23", AND INITATE RTD (SPACE BAR).

NOTE

IF A LOCAL TERMINAL IS CONNECTED TO TERMINAL 1, LOGIN WILL APPEAR ON THE LOCAL TERMINAL SCREEN AFTER RTD IS INITIATED. DO NOT LOG IN AT THE LOCAL TERMINAL. THIS WOULD DISABLE THE REMOTE TERMINAL.

6. CALL A CONVENIENT RTA CENTER.

** NOTE**

IF CALLING THE WORLD SUPPORT CENTER IN MINNEAPOLIS FROM:
   A. WITHIN THE UNITED STATES, EXCLUDING MINNESOTA, DIAL 800-328-3980.
   B. A COUNTRY OTHER THAN THE UNITED STATES OR MINNESOTA DIAL 612-931-3131.

7. INSTRUCT THE TECHNICAL SUPPORT PERSON AT THE RTA CENTER TO SET THE SWITCHES ON THE REMOTE COUPLER TO:

```
*************RS232****************************CCITT****************
*                                *                                *
* - F/H TO H                     * -F/H TO H                      *
* - O/A TO O                     * - O/A TO O                     *
*                                * - AC/DAA TO AC
*                                *                                *
*******************************************************************
```

NOTE

SOME OF THE COUPLERS AND TERMINALS AT RTA CENTERS MAY VARY. THIS MAY REQUIRE SOME VARIATION IN THE SWITCH SETTINGS.

8. INSTRUCT THE SUPPORT PERSON TO SET THE SWITCHES ON THE REMOTE TERMINAL TO:
   A. EVEN PARITY
   B. FULL DUPLEX
   C. 300 BAUD
   D. 64-CHARACTER
   E. AUTOMATIC SCROLL (PAGE KEY DISABLE)

9. REQUEST THAT SUPPORT PERSON LOGIN "CDCES" AND RUN A DIAGNOSTIC TEST ON THE SITE COMPUTER. TO ALLOW THE SUPPORT PERSON TO RUN A TEST, PLACE THE TELEPHONE INTO THE ACOUSTIC COUPLER.

10. MONITOR RTA ACTIVITY ON THE SYSTEM CONSOLE UNTIL TESTING IS COMPLETED.

CORRECTIVE MAINTENANCE

This section contains the board cleaning and clock tuning procedures. Before performing a procedure, read through it to determine the need for special tools, test equipment, materials, and skills

Procedures appear in numerical order. Within each procedure, required items and references appear in the order that they are used.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local Supply	Gold-Wipes (TEXWIPE TX809)
94211400	Lint-free disposable cloths
12263513	Trichloroethane solvent (16 oz) spray can
12263294	Solvent spray brush
Local supply	Disposable absorbent wipers
12263512	Freon TMS solvent (16 oz) spray can

REFERENCES

This procedure references the following procedure:

7CX00012 Static-Sensitive Parts Handling

INTRODUCTION

Cleaning an LSI board, auxiliary board, ZIF board, or ZIF interconnect board removes foreign substances from the edgeboard pins or flux from the solder connections.

EDGEBOARD PINS

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in Procedure 7CX00012, Static-Sensitive Parts Handling.

1. Clean the edgeboard pins using gold wipes or a lint-free disposable cloth moistened with trichloroethane solvent.

2. To avoid snagging cloth fibers on the pins or other sharp points near the connector edge of the board, use a wiping motion that is parallel to the pins and goes off the end of the pins.

SOLDER CONNECTIONS

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in Procedure 7CX00012, Static-Sensitive Parts Handling.

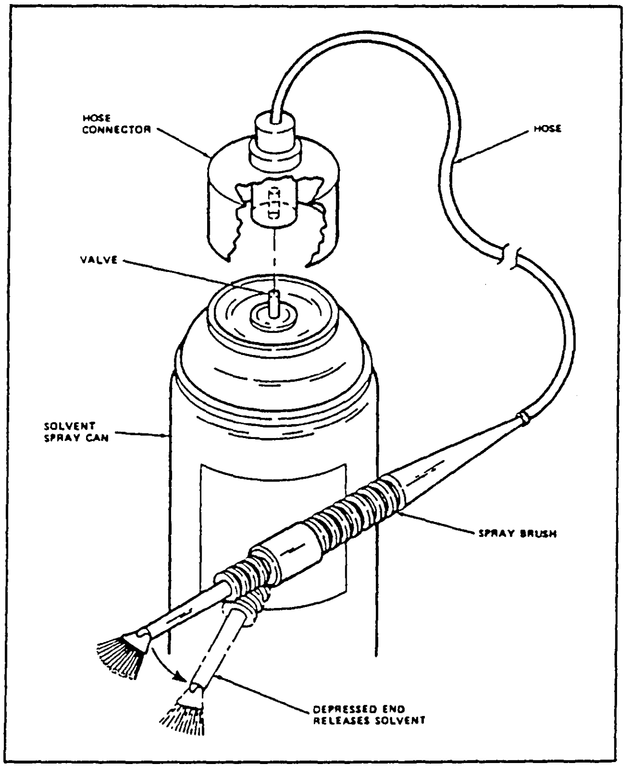
NOTE

Clean board immediately after you complete fluxing and soldering.

1. Remove cover and spray tip from spray can of trichloroethane.
2. Press hose connector of spray brush onto valve of solvent spray can. Pressurized solvent flows to spray brush.

NOTE

Pressing on lower end of brush releases solvent from brush.



Board Cleaning Materials

3. Place several layers of disposable absorbent wipers on work surface.
4. Place edge of board on wipers and hold it at an angle to allow sprayed solvent to run onto wipers.
5. Remove all traces of flux and particles by spraying and brushing fluxed area of board.
6. Dry board in air for about 2 minutes.
7. Thoroughly flush board and components by spraying area being cleaned with Freon TMS solvent.
8. Dry board in air for about 2 minutes.
9. Dispose of wipers.
10. Release pressure in hose and spray brush before storage by removing hose connector from solvent spray can.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
12263279	John Fluke Model 8020A digital multimeter
00219490	Tektronix P6202A active scope probe (three required)
Local Supply	Hewlett-Packard Model 1725A oscilloscope (or equivalent)
Local Supply	Scope probe LSI tip
18697523	Scope probe hook tip

INTRODUCTION

Clock tuning consists of checking the clock timing. The tuning procedure involves making temporary cable connections between the master oscillator and various parts of the central memory (CM), input/output unit (IOU), and central processor (CP). When a tuning adjustment is necessary, the procedure specifies which components to change and in which order.

The master clock and the clock fanouts are adjusted at the factory. The times are recorded in the Clock Tuning Document which is shipped with each system.

NOTE

Clock tuning is not usually performed by field personnel. If a qualified installer is not on site, contact World Support Center (WSC).

OSCILLOSCOPE CALIBRATION

1. Connect probes to oscilloscope channels A and B vertical inputs.

2. Check probe calibration according to manufacturer´s calibration procedure using internal square wave generator in oscilloscope as signal source.

NOTE

Use probe ground leads that are as short as possible and of equal length. Short ground leads reduce noise effects on signals.

3. Set up oscilloscope as follows:
   a. MAIN SWEEP to 0.02 usec/div.
   b. Sweep magnifier to 10X.
   c. V/div (vertical) to 50mV/div.
   d. INT trigger.
4. Connect channels A and B probes to the Master Oscillator board at A14-TP30 in CM.
5. Oscilloscope traces must be identical, with no readable deviation on leading or trailing edges. If necessary, recalibrate or change probes to obtain identical traces.

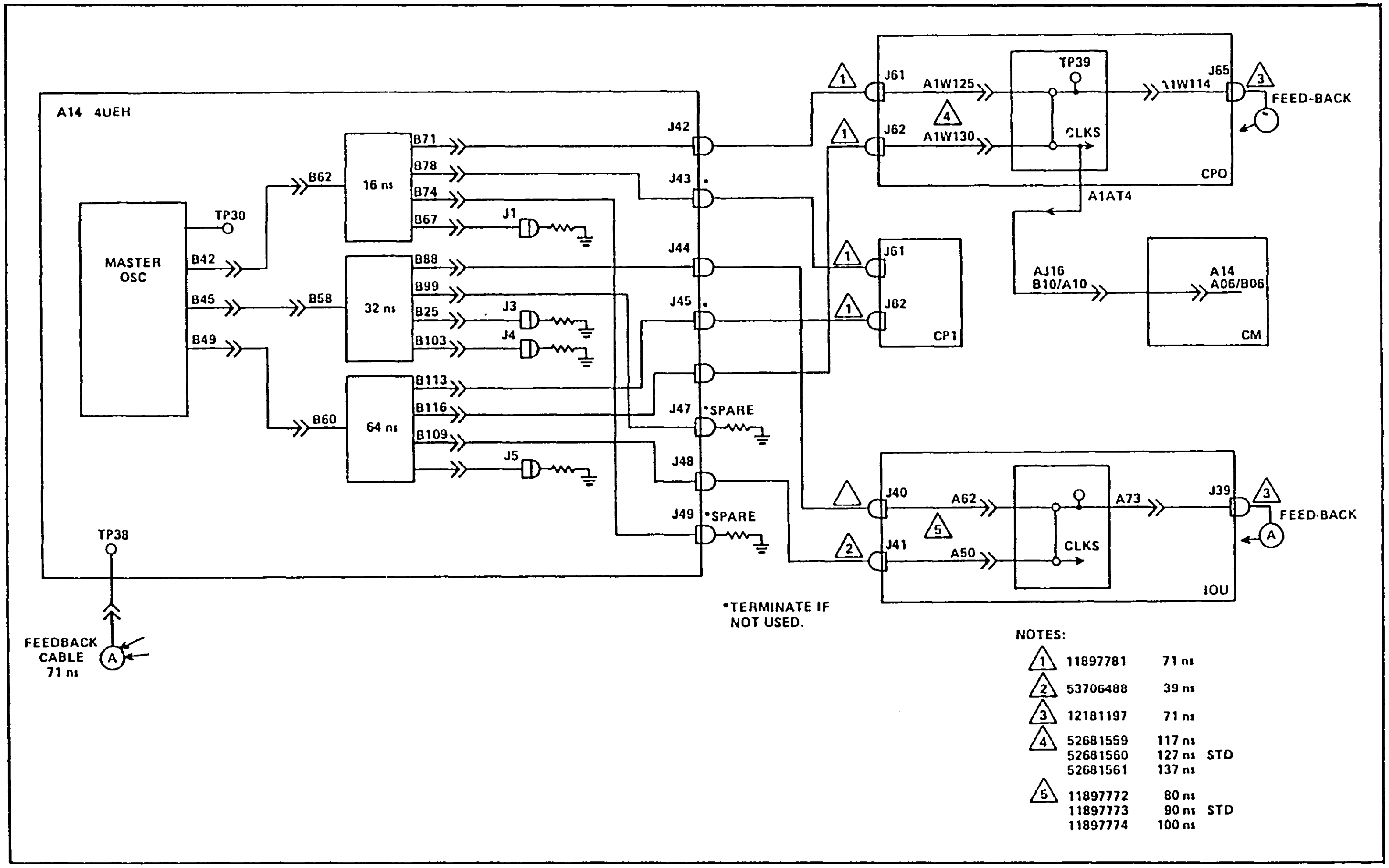
WAVEFORM MEASUREMENT TECHNIQUES

The following techniques are general and apply to all parts of the clock tuning procedure:

a. Set ground level of both oscilloscope traces at 2.6 divisions above centerline of display screen.
b. Make measurements at center of screen and at center of expanded trace.
c. Make signal measurements on high-to-low transitions unless otherwise indicated. These transitions will be referred to as the leading edge.

OSCILLOSCOPE NOMINAL CONTROL SETTINGS

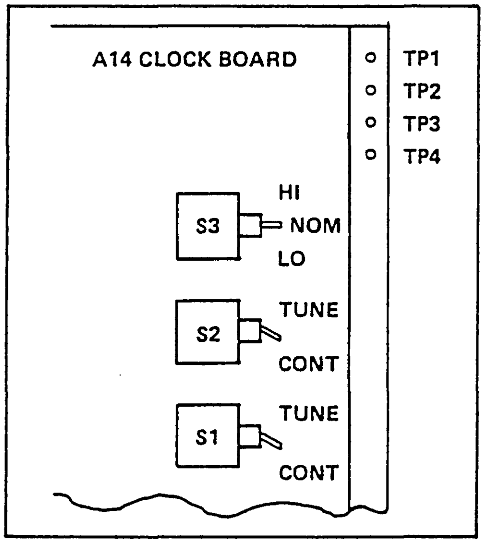
a. Set vertical to 0.05 V/div.
b. Set MAIN SWEEP to 0.05 usec/div.
c. Select EXT NEG trigger.
d. Select 10X MAG.
e. Select channel A as reference channel.



Block Diagram, Clock System

16-ns CLOCK CHECK AT J42

1. Disconnect cable from J42 in CM cabinet.
2. Connect tuning feedback cable between J42 and master oscillator at A14-B/A64 (signal on B, ground on A).
3. Set S3 on master oscillator board to NOM, set S2 to TUNE.



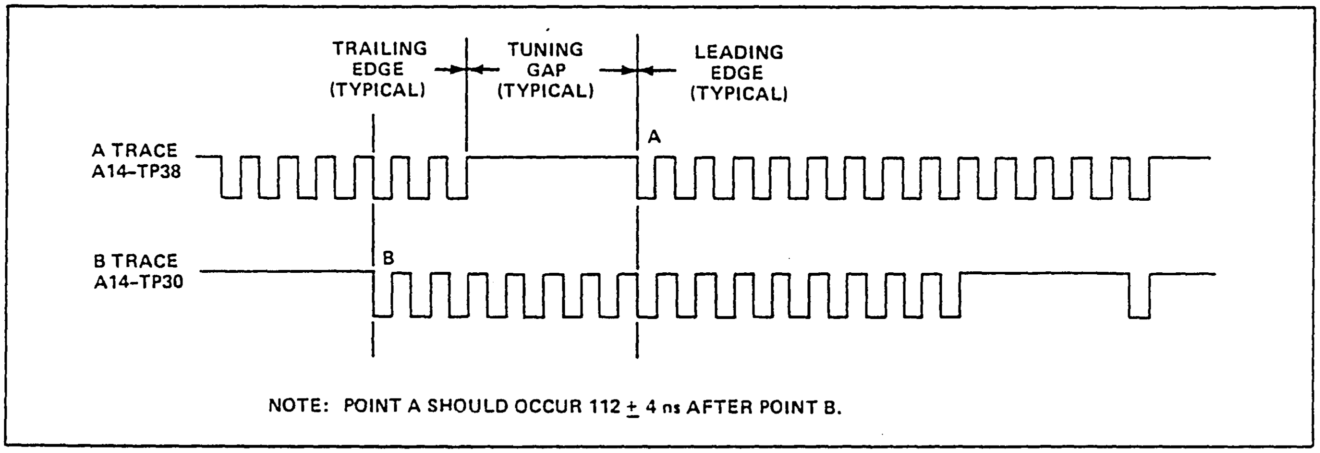
Master Oscillator Switch Locations

4. Connect channel A probe to A14-TP38, channel B probe to A14-TP30.
5. Connect external sync probe to A14-TP7.

NOTE

Leave probes connected to these test points through the 16-ns PHASING CHECK AT J43 adjustment.

6. Observe that leading edge of tuning gap on channel A occurs 112 ± 4 ns after leading edge of tuning gap on channel B.



NOTE: POINT A SHOULD OCCUR 112 ± 4 ns AFTER POINT B.

16-ns Skew Check (J42) Waveforms

7. Correct any timing problem by replacing following items sequentially:

   a. Master oscillator board at A14.

   b. Cable B.

   c. Cable A.

   d. Cable E.

   e. Tuning cable with known good cable.

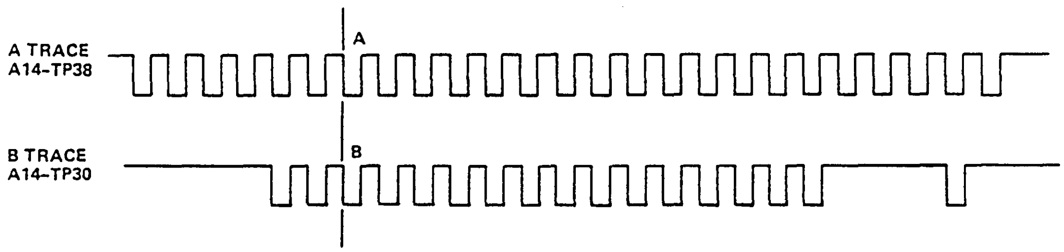
8. Remeasure timing after each replacement to verify correction.

16-ns PHASING CHECK AT J42

1. Set switch S2 to CONT.

2. Set oscilloscope MAIN SWEEP to 0.010 usec/div.

3. Observe channel A and channel B waveforms. If time between leading edges of channel A and channel B is greater than ± 1.0 ns, perform step 7 of 16-ns SKEW CHECK AT J42 adjustment.



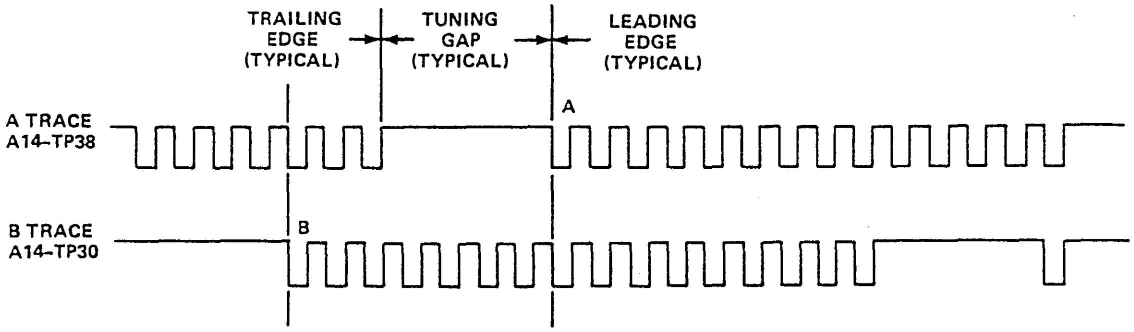
NOTES:

1. READING IS TO BE TAKEN ON THE 3RD HIGH TO LOW TRANSITION AFTER THE TUNING GAP.
2. POINT A MUST BE WITHIN 1 ns OF POINT B.

16-ns Phasing Check (J42) Waveforms

16-ns SKEW CHECK AT J43

1. Remove terminator from J43.
2. Remove feedback cable from J42 and plug it into J43.
3. Connect P3 cable previously removed from J42 back to J42.
4. Set S2 to TUNE.
5. Observe channel A and channel B waveforms. If leading edge of tuning gap on channel A does not occur 112 ± 4 ns after leading edge of tuning gap on channel B, perform step 7 of 16-ns SKEW CHECK AT J42 adjustment.

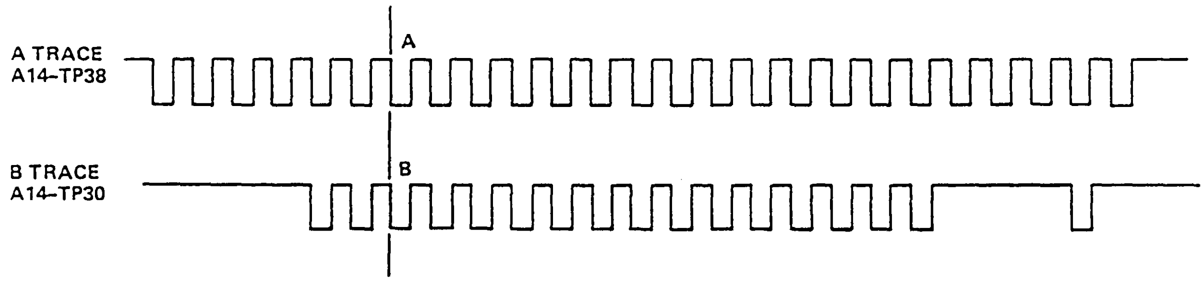


NOTE: POINT A SHOULD OCCUR 112 ± 4 ns AFTER POINT B.

16-ns Skew Check (J43) Waveforms

16-ns PHASING CHECK AT J43

1. Set S2 to CONT.
2. Observe channel A and channel B waveforms. If time between leading edges of channel A and channel B is greater than ± 1.0 ns, perform step 7 of 16-ns SKEW CHECK AT J42 adjustment.



NOTES:

1. READING IS TO BE TAKEN ON THE 3RD HIGH TO LOW TRANSITION AFTER THE TUNING GAP.
2. POINT A MUST BE WITHIN 1 ns OF POINT B.

16-ns Phasing Check (J43) Waveforms

32-ns GATING CHECK

1. Remove tuning feedback cable from J43 and reinstall terminator previously removed.

NOTE

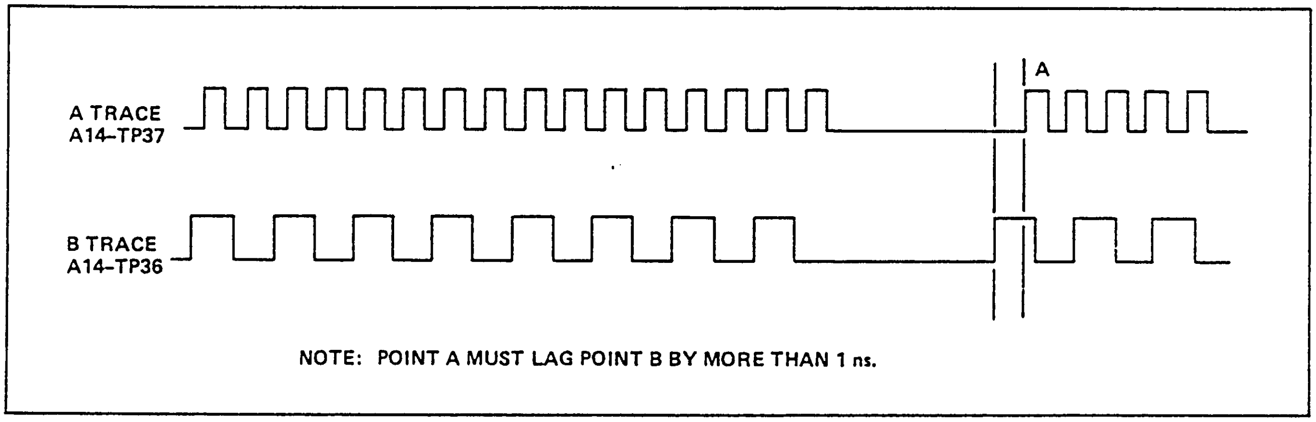
Ensure that all clock output jacks have cables or terminators connected to them.

2. Set S2 to TUNE.
3. Move channel A probe to A14-TP37, move channel B probe to A14-TP36 (in CM).

NOTE

The leading edge of the signal is the low-to-high transition in this reading only.

4. Observe channel A and channel B waveforms. If leading edge of channel A does not lag leading edge of channel B by at least 1.0 ns, replace Master Oscillator board at A14 and perform all previous clock checks.

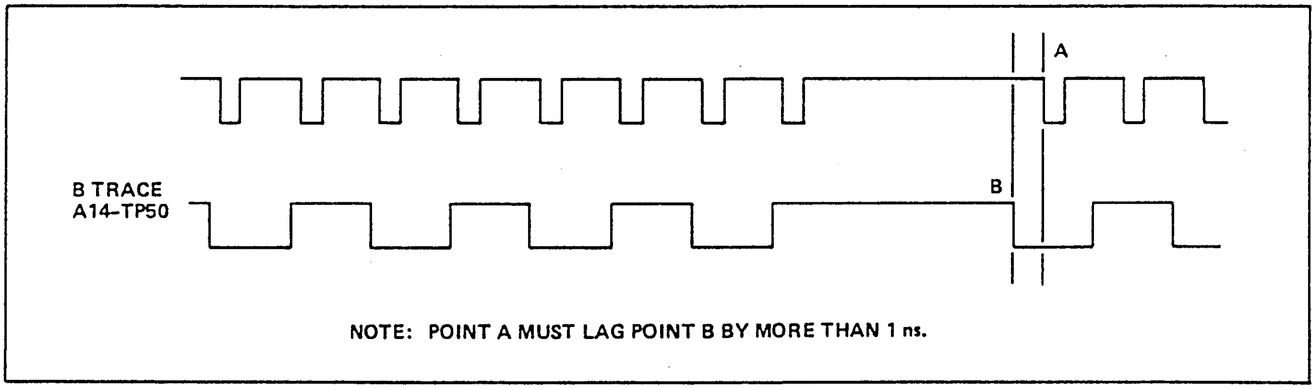


NOTE: POINT A MUST LAG POINT B BY MORE THAN 1 ns.

32-ns Gating Check Waveforms

64-ns GATING CHECK

1. Move channel A probe to A14-TP51, move channel B probe to A14-TP50.
2. Observe channel A and channel B waveforms. If leading edge of channel A does not lag leading edge of channel B by at least 1.0 ns, replace Master Oscillator board at A14 and perform all previous clock checks.

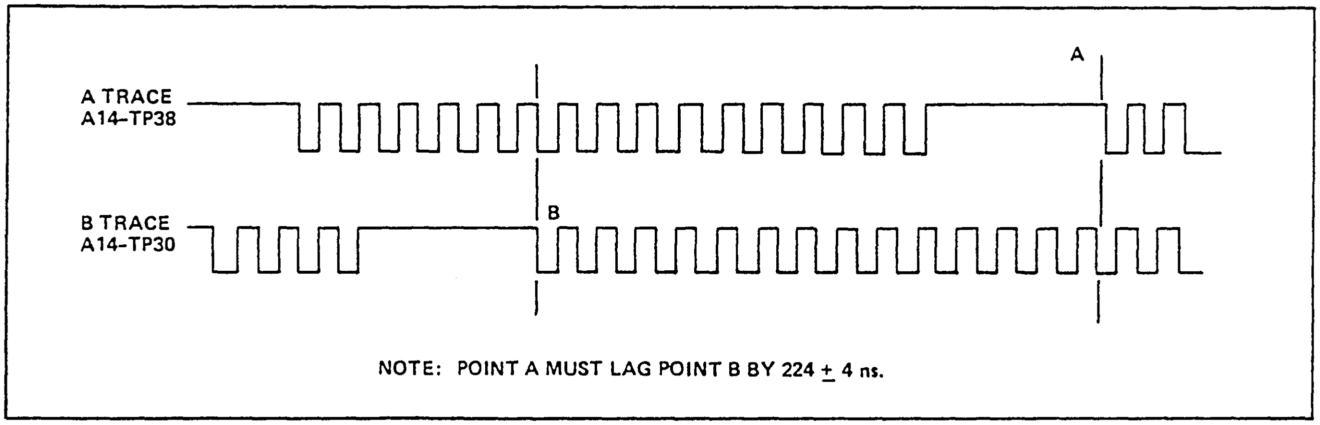


NOTE: POINT A MUST LAG POINT B BY MORE THAN 1 ns.

64-ns Gating Check Waveforms

CP SKEW CHECK

1. Connect tuning feedback cable to J65 in CP.
2. Set S2 to TUNE.
3. Move channel A probe to A14-TP38, move channel B probe to A14-TP30.
4. Leave external sync probe on A14-TP7.
5. Set MAIN SWEEP on oscilloscope to 0.5 usec/div.
6. Observe channel A and channel B waveforms. If leading edge of channel A waveform does not lag leading edge of channel B waveform by 224 ± 4 ns, correct timing problem as follows:



CP Skew Check Waveforms

a. Change length of CP cable D between J61 and 3A1AW-125, using one of the following cables.

Part Number	Delay Time	Length
52681559	11.7 ns	274.1 cm (107.9 in)
52681560 (standard)	12.7 ns	297.4 cm (117.1 in)
52681561	13.7 ns	321.0 cm (126.4 in)

b. Remeasure timing after each replacement to verify correction. Proceed to next substep only if timing problem still exists.

c. Replace following items sequentially until problem is corrected:

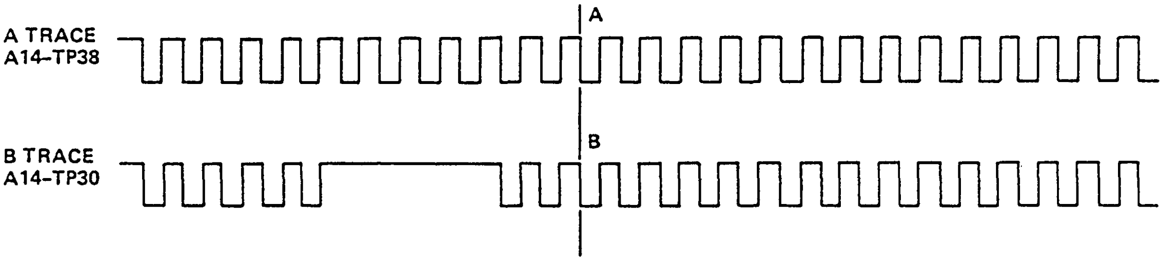
- Master oscillator board A14 in CM.
- Cable C.
- Cable D (standard length).

d. Remeasure timing after each replacement to verify correction.

e. Perform all previous clock checks if board at A14 is replaced.

CP PHASING CHECK

1. Set S2 to CONT.
2. Set MAIN SWEEP on oscilloscope to 0.01 usec/div.
3. Observe that leading edge of channel A waveform is within 1.0 ns of leading edge of channel B waveform.



NOTE: READING IS TO BE TAKEN ON THE 3RD HIGH TO LOW TRANSITION AFTER THE TUNING GAP. POINT A MUST BE WITHIN 1 ns OF POINT 3.

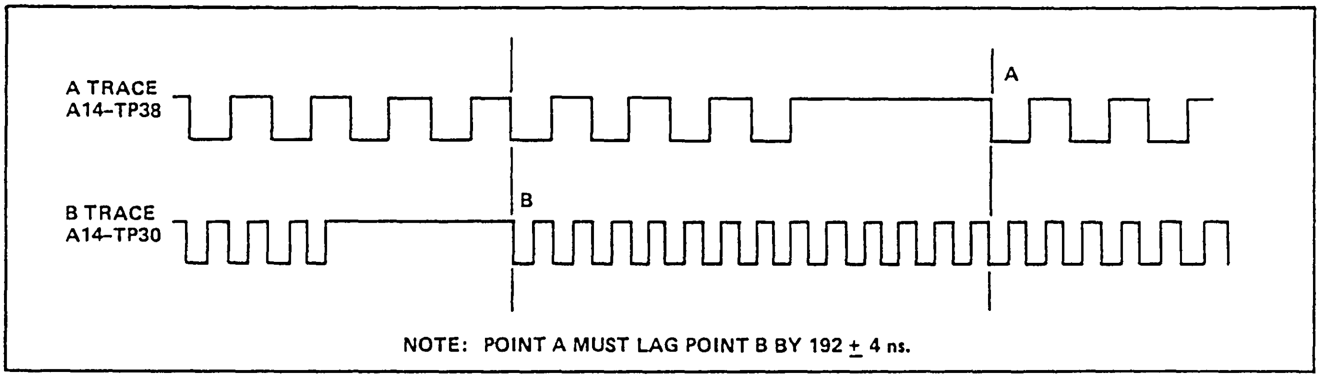
CP Phasing Check Waveforms

4. Correct any timing problem by performing step 6 of CP SKEW CHECK. If corrective action requires replacement of CP cable D, replacement cable must satisfy requirements of both CP Phasing Check and previous CP Skew Check.

IOU SKEW CHECK

1. Move clock tuning feedback cable from J65 on CP to J42 on IOU.
2. Set S2 to TUNE.
3. Set MAIN SWEEP to 0.2 usec/div.

4. Observe that leading edge of channel A waveform lags leading edge of channel B waveform by 192 ± 4 ns.



NOTE: POINT A MUST LAG POINT B BY 192 ± 4 ns.

IOU Skew Check Waveforms

5. Correct any timing problem as follows:

   a. Change length of CP cable D between J61 and 3A1AW-125, using one of the following cables.

NEW P/N	Part Number	Delay Time	Length
22105601	11897771	6.5 ns	158.8 cm (62.5 in)
22105602	11897772	8.0 ns	189.2 cm (74.5 in)
22105603	11897773 (standard)	9.0 ns	212.1 cm (83.5 in)
22105604	11897774	10.0 ns	236.2 cm (93.0 in)
22105605	11897775	10.8 ns	254.0 cm (100.0 in)

   b. Remeasure timing after each replacement to verify correction. Proceed to next substep only if timing problem still exists.

   c. Replace following items sequentially until problem is corrected:

   - Master oscillator board A14 in CM.
   - Cable C2.

   d. Remeasure timing after each replacement to verify correction.

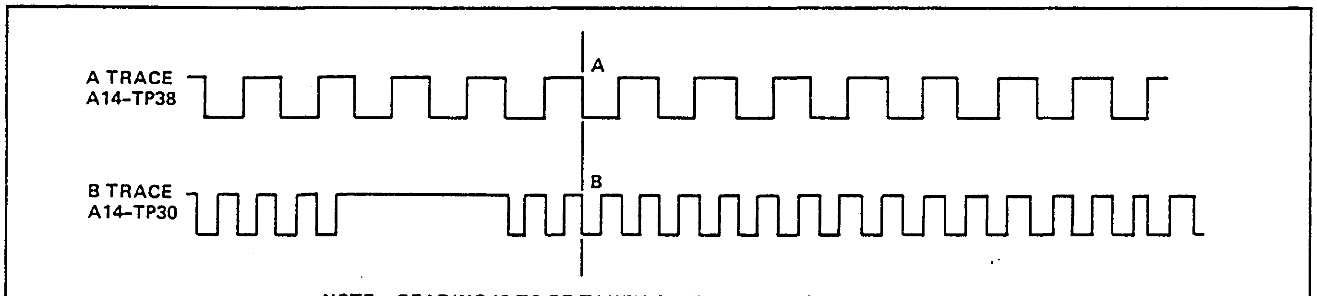
   e. Perform all previous clock checks if A14 is replaced.

IOU CLOCK PHASING CHECK

1. Set S2 to CONT.

2. Set MAIN SWEEP on oscilloscope to 0.01 usec/div.

3. Observe that leading edge of channel A waveform is within 1.0 ns of leading edge of channel B waveform.



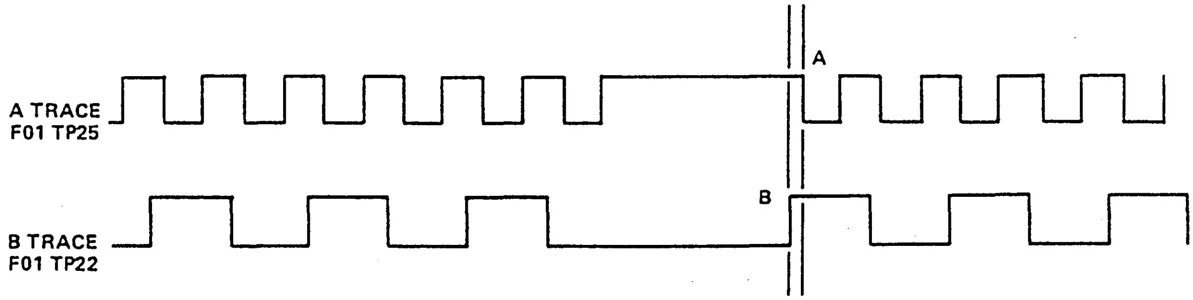
NOTE: READING IS TO BE TAKEN ON THE 3RD HIGH TO LOW TRANSITION FOLLOWING THE TUNING GAP. POINT A MUST BE WITHIN 1 ns OF POINT B.

IOU Clock Phasing Check Waveforms

4. Correct any timing problem by performing step 4 of IOU SKEW CHECK adjustment. If corrective action requires replacement of IOU cable D, replacement cable must satisfy requirements of both IOU Clock Phasing check and IOU Skew Check.

IOU SUBSYSTEM CHECKS

1. Set S2 to TUNE.
2. Move channel A probe to F01-TP25 on IOU, move channel B probe to F01-TP22 on IOU.
3. Leave external sync probe on A14-TP7.
4. Observe leading edge of channel A waveform (high-to-low transition) lags leading edge of channel B waveform (low-to-high transition) by 2-12 ns.

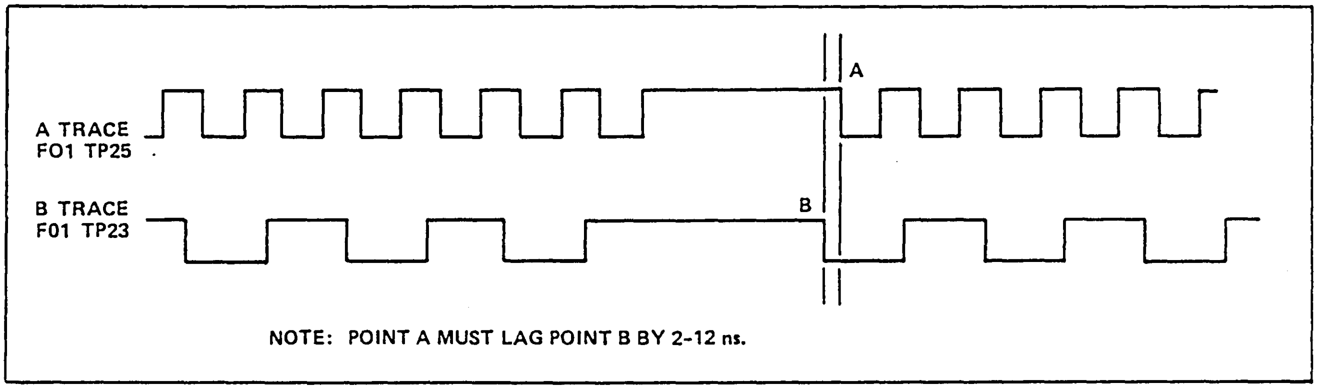


NOTE: POINT A MUST LAG POINT B BY 2-12 ns.

IOU Subsystem Waveforms

5. Move channel B probe to F01-TP23 on IOU. Channel A and external sync probes are not moved.

6. Observe leading edge of channel A waveform (high-to-low transition) lags leading edge of channel B waveform (low-to-high transition) by 2-12 ns.



NOTE: POINT A MUST LAG POINT B BY 2-12 ns.

IOU Subsystem Check Waveforms

7. Correct any timing problem in either step 4 or step 6 as follows:

   a. Replace following items sequentially until problem corrects.

      - Master oscillator board at A14 in CM.
      - Cable C.

   b. Remeasure timing after each replacement to verify correction.

   c. Perform all previous clock checks if A14 board is replaced.

CM CLOCK FANOUT CHECK

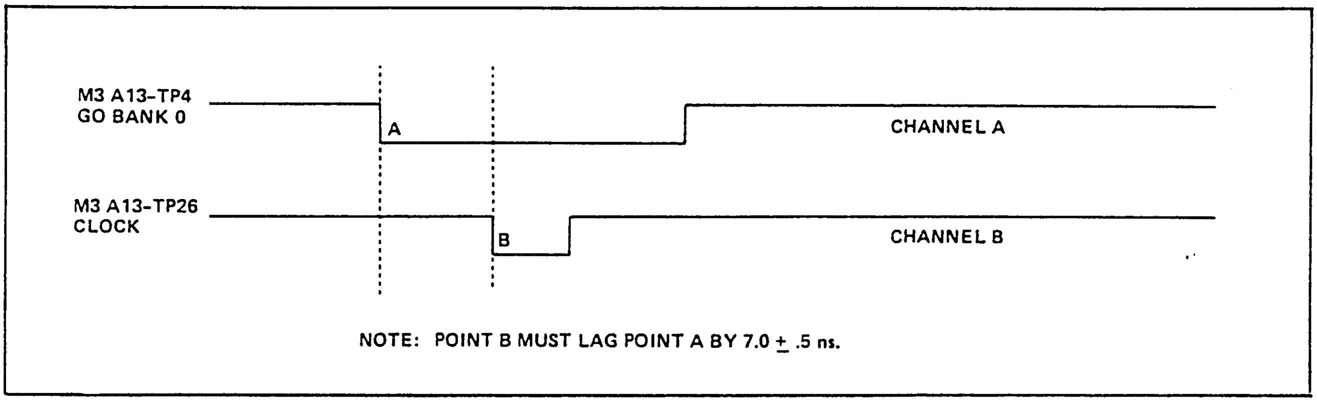
1. Set S2 to TUNE.

2. Move channel A probe to A13-TP4 in CM, move channel B probe to A13-TP26 in CM.

3. Set oscilloscope trigger INT NEG on channel A.

4. Master clear memory.

5. Observe leading edge of waveform on channel B lags leading edge of waveform on channel A by 7.0 ± 0.5 ns.



CM Clock Fanout Check Waveforms

6. Correct any timing problem by adjusting length of twisted wire pair between AJ16-B10/A10 and A14-A06/B06 on CM.

NOTE

Signal wire on A10 must connect to B06.
Propagation delay for this wire is 0.166 ns/in.

7. Remeasure clock timing to verify any corrections.

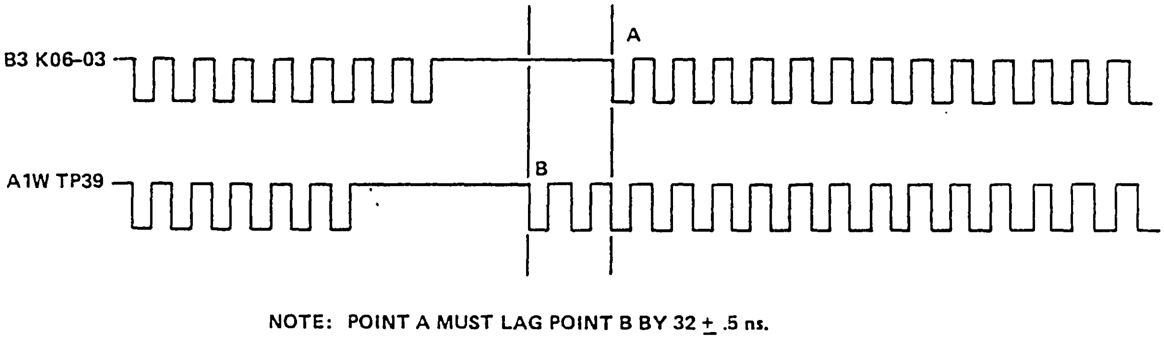
CP CLOCK FANOUT CHECK

1. Set S2 to TUNE.

2. Move channel A probe to B3-K06-03 in CP, move channel B probe to A1W-TP39 in CP.

3. Set oscilloscope to EXT trigger. Connect external sync probe to A14-TP7.

4. Observe leading edge of waveform on channel A lags leading edge of waveform on channel B by 32 ± 0.5 ns.



CP Clock Fanout Check Waveforms

5. Correct any timing problem by modifying length of coax cable between A1W-P10-79 and A1W-P10-63 and the coax cable between A1W-P10-87 and A1W-P10-133.

NOTE

Divide the length change equally between the two cables.

SECOND CP CLOCK TUNING PROCEDURES

When a second CP is added to the system, the only adjustments that need to be made are:

CP SKEW CHECK

CP PHASING CHECK

CP CLOCK FANOUT CHECK

FIELD REMOVAL AND REPLACEMENT

Field removal and replacement procedures are for subassemblies and components that might cause personnel hazards, equipment damage, or procedural problems without the use of specific instructions.

Before doing a procedure, read all of the steps to gain familiarity with them and to determine the need for special tools, test equipment, materials, and qualifications of maintenance personnel.

The procedures specify removing and applying power to the system or to individual chassis columns. You must, therefore, be familiar with power-on and power-off procedures before beginning any of the field removal and replacement procedures. For the system power procedures, refer to the Power Distribution and Warning Manual listed in the System Publication Index. (Procedure 7CX00009, Chassis Column Power Removal/Application, is duplicated in this manual for convenience.)

WARNING

To prevent contact with hazardous voltages, power removed during a removal procedure must remain removed during the replacement procedure. The procedures assume that replacement directly follows removal and therefore do not repeat the power removal steps in the replacement procedures.

Steps for opening and closing cabinet doors are normally part of every removal and replacement procedure. Since these steps are common knowledge to you, they are left out of the procedures to avoid unnecessary repetition of text.

The procedures are numerically organized by procedure number. A numerical index is given in the table of contents of this manual; an alphabetical index grouped by functional area is given in this section. Within each procedure, required items and references are listed in the order of appearance in the procedure.

NOTE

All tools needed to perform a given procedure are listed within the procedure in the order used. Reference to other procedures within a given procedure are also in order of occurrence.

NOTES

1. To remove and replace central memory backpanel connector pins, use Procedure 7CX00031, ZIF Backpanel Pin Removal/Replacement.

2. In the "Page" column, a page number indicates that the procedure is in this manual. "Power" indicates that the procedure is in the Power Distribution and Warning Systems Manual which is listed in the Systems Publication Index.

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REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
12263495	Antistatic work pad
12263279	John Fluke Model 8020A digital voltmeter
Local supply	Freon TF solvent
94211400	Lint-free disposable cloths
Local supply	Gold-Wipes (Texwipe TX809)

REFERENCE

This procedure references the following procedure.

7CX00009 Chassis Column Power Removal/Application

INTRODUCTION

Auxiliary boards each contain up to 85 ECL 100K series microcircuits. The boards mount in specified locations of LSI panel assemblies. All auxiliary boards have the same removal and replacement procedures.

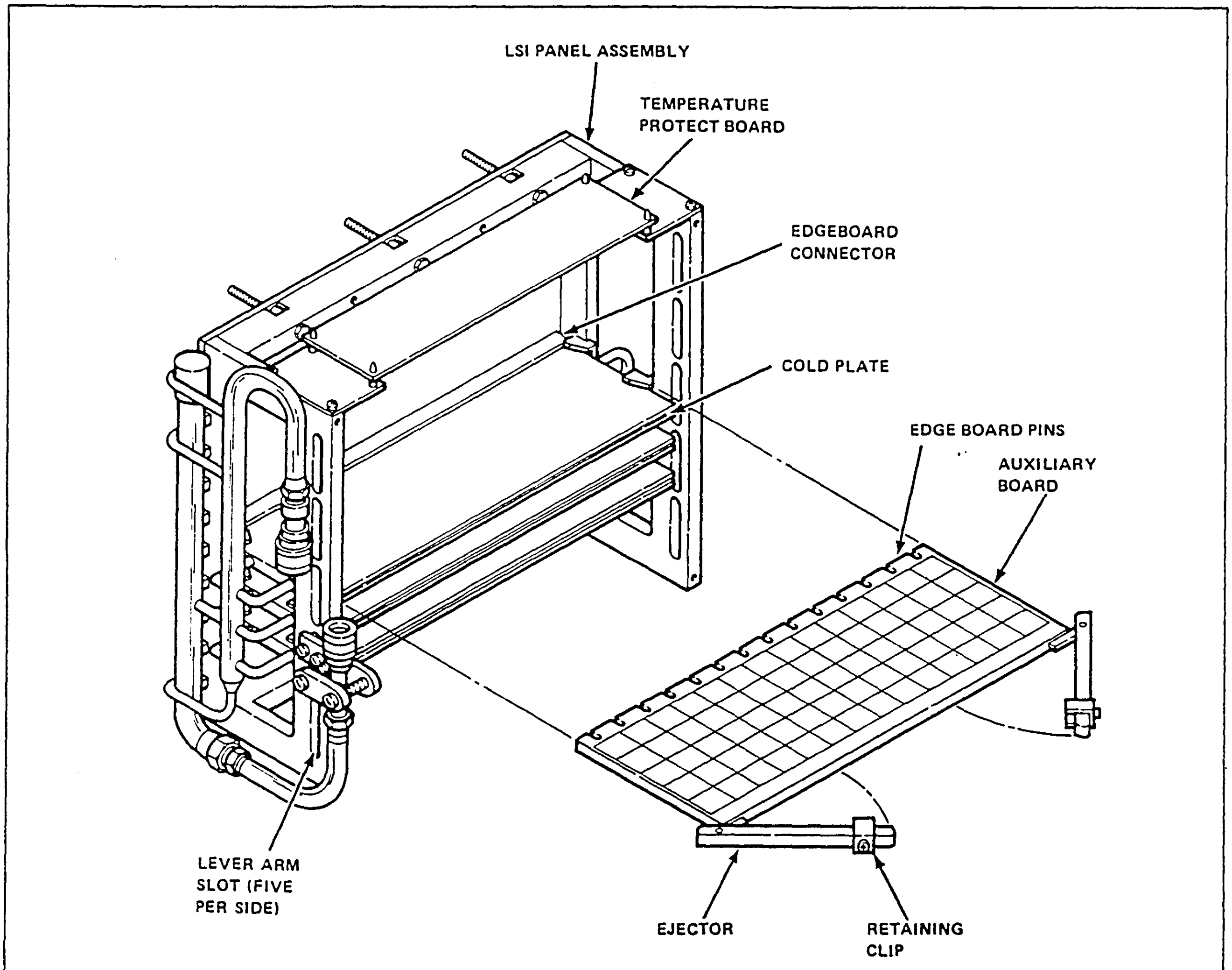
CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

REMOVAL

1. Remove power from chassis column containing auxiliary board according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Put on antistatic wrist strap and connect it to chassis ground.



NOTE:

NUMBERS AND LOCATIONS OF COLD PLATES AND AUXILIARY BOARDS ARE DEPENDENT ON SPECIFIC LSI PANEL ASSEMBLY.

LSI Panel Assembly and Auxiliary Board

3. Unseat auxiliary board from its connector by simultaneously pulling both ejectors outward from board.

CAUTION

To prevent corrosion of auxiliary board connector pins, avoid touching them.

4. Slide board straight out of panel assembly. Place board in antistatic bag.

REPLACEMENT

NOTE

Before installing an auxiliary board, make sure that power has been removed from the chassis column according to procedure 7CX00009, Chassis Column Power Removal/ Application.

1. Put on antistatic wrist strap. If auxiliary board is new or is being replaced without rework, go to step 2. Otherwise, test board for short circuits as follows.

   a. Place board (in its antistatic bag) on work surface fitted with antistatic pad connected to raised-floor grid ground.

   b. Connect wrist strap to antistatic pad. Remove board from its bag.

CAUTION

To prevent microcircuit damage during short-circuit testing, use only a John Fluke Model 8020A digital multimeter switched to an ohms scale.

   c. Test board for short circuits with Fluke multimeter. Test any circuit between ground and a -2.2 V pin, ground and a -4.7 V pin, and between a -2.2 V and a -4.7 V pin. Correct any short circuits.

   d. Place board in its bag. Disconnect wrist strap from antistatic pad.

2. Carry board, in its bag, to panel assembly. Connect wrist strap to chassis ground.

3. Remove board from its antistatic bag. Check board connector pins for cleanliness. If they need cleaning, perform the following steps:

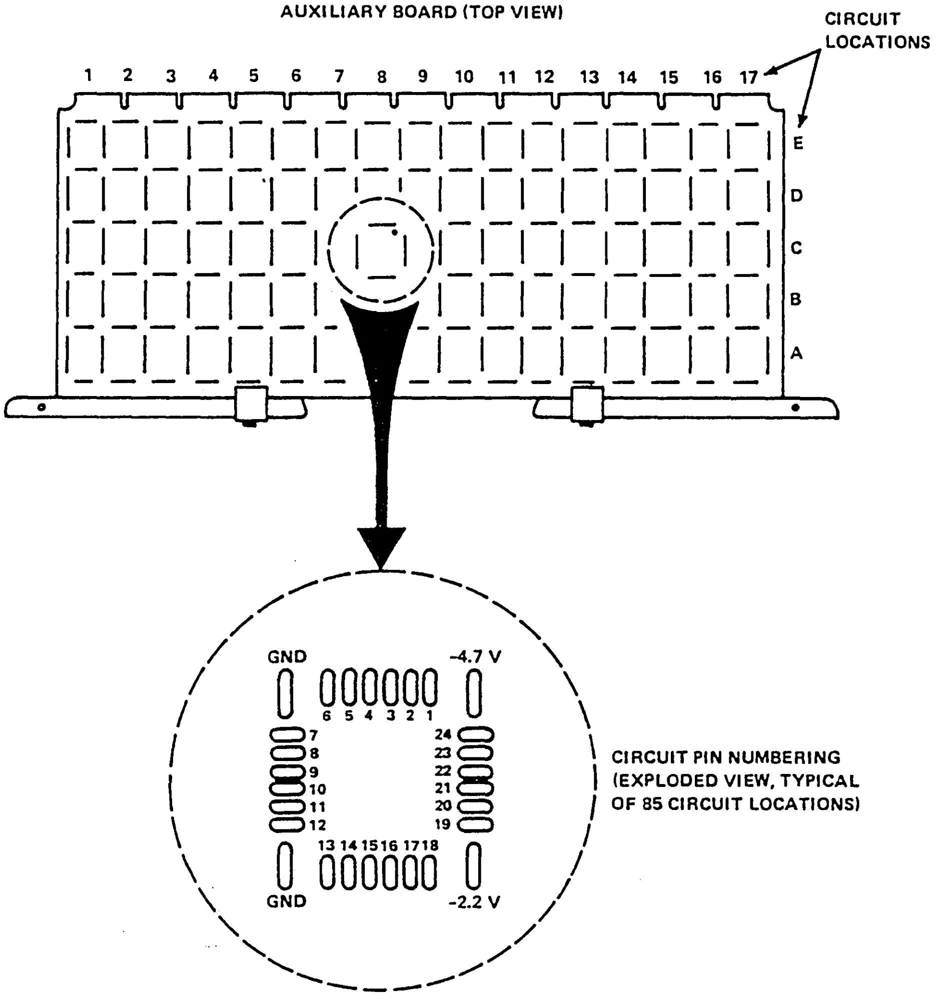
   a. Clean the edgeboard pins using gold wipes or a lint-free disposable cloth moistened with freon solvent.

   b. To avoid snagging cloth fibers on the pins or other sharp points near the connector edge of the board, use a wiping motion that is parallel to the pins and goes off the end of the pins.

4. With its ejectors extended, slide board into guide blocks in panel assembly until board touches connectors on panel assembly.

5. Check alignment of board with its connectors on panel assembly. Adjust alignment if necessary.

6. Seat board in its connectors by simultaneously pushing both ejectors toward board with thumbs. Retainer clip on each ejector must close over board edge and edge of adjacent cold plate. Ensure that retainer clips do not lodge between board and cold plate.



NOTES:

1. THE PIN NUMBERS SHOWN ALSO APPLY TO THE CIRCUITS ON ZIF BOARDS.
2. A DOT ON TOP OF THE LOGIC CIRCUIT IDENTIFIES PIN 1 OF THE CIRCUIT WITH PIN 1 ON THE AUXILIARY BOARD.

Auxiliary Board Circuit Pin Identification

Supplement for: AD112-C, AD113-A
Date: 07/19/85
Revision: A

SUPPLEMENTAL INFORMATION

Before removing LSI panels, it may be necessary to remove the vertical latch support post between columns 2 and 3.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
Local supply	Absorbent wipers (Kaydry)
Local supply	No. 2 flat-blade screwdriver
00219492	LSI board stiffener
Local supply	Drive socket wrench
00219315	Torque wrench
Local supply	6-in extender for socket/torque wrench
Local supply	5/16-in socket for socket/torque wrench
Local supply	Q-Tip swabs
Local supply	Lubriplate LPS lubricant
12263495	Antistatic work pad
00217372	Antistatic container for LSI panel assembly
00210903	Male coax pin straightener
00217329	Locator board for LSI panel
00219334	Water hose quick-disconnect pliers
Local supply	Tape (masking or electrical)

REFERENCES

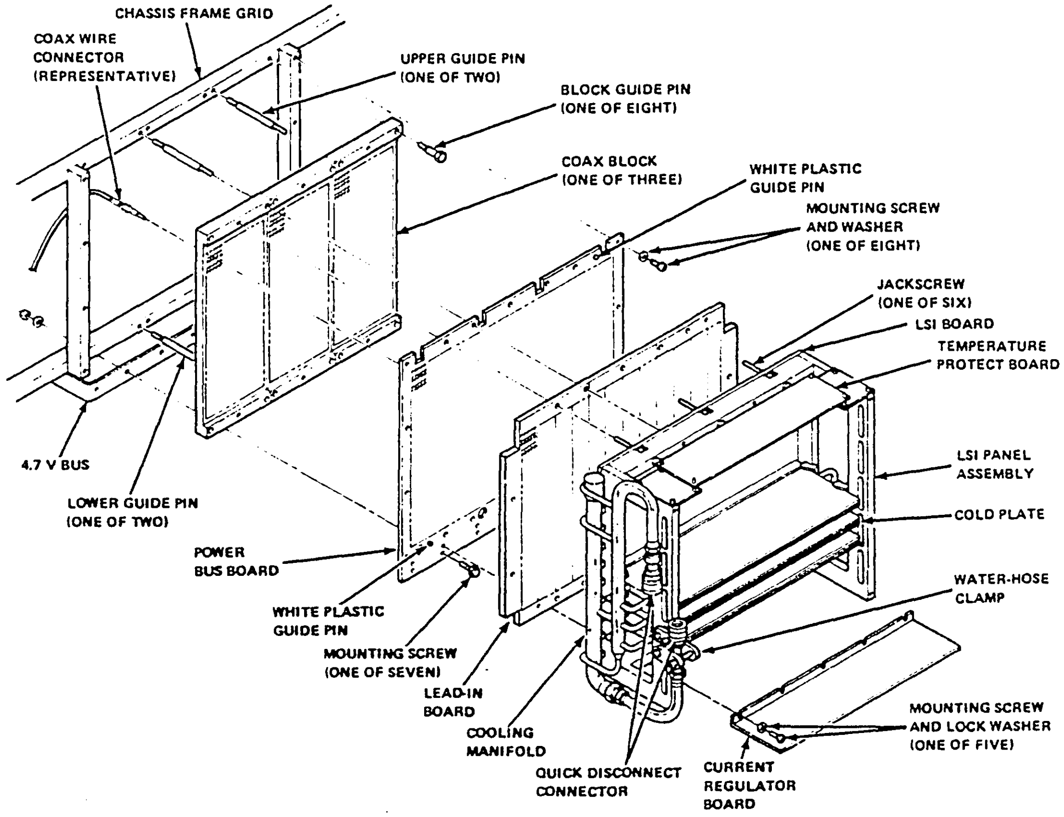
This procedure references the following procedures.

7CX00009	Chassis Column Power Removal/Application
7CX00007	Auxiliary Board Removal/Replacement
7CX00010	Chassis Column Current-Limit Test
7CX00015	LSI Panel Current Limit Test
7CX00069	LSI Panel Flatness Test

INTRODUCTION

Each LSI panel assembly contains a multilayered LSI board that contains 150 connector locations arranged in 15 columns and 10 rows. Each row may contain 15 connectors for either LSI arrays or half-pak arrays.

Depending on panel function, a row may also accept two auxiliary boards. This is a factory adaptation that places two rows (upper and lower) of auxiliary board connectors in place of one LSI connector row. A cold plate between the two auxiliary boards cools them. The following removal/replacement procedures apply to all panel assemblies, regardless of number and location of auxiliary boards.


CHASSIS FRAME GRID
COAX WIRE CONNECTOR (REPRESENTATIVE)
UPPER GUIDE PIN (ONE OF TWO)
BLOCK GUIDE PIN (ONE OF EIGHT)
COAX BLOCK (ONE OF THREE)
WHITE PLASTIC GUIDE PIN
MOUNTING SCREW AND WASHER (ONE OF EIGHT)
JACKSCREW (ONE OF SIX)
LSI BOARD
TEMPERATURE PROTECT BOARD
LSI PANEL ASSEMBLY
COLD PLATE
WATER-HOSE CLAMP
MOUNTING SCREW AND LOCK WASHER (ONE OF FIVE)
4.7 V BUS
LOWER GUIDE PIN (ONE OF TWO)
POWER BUS BOARD
WHITE PLASTIC GUIDE PIN
MOUNTING SCREW (ONE OF SEVEN)
LEAD-IN BOARD
COOLING MANIFOLD
QUICK DISCONNECT CONNECTOR
CURRENT REGULATOR BOARD

LSI Panel Assembly

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

REMOVAL

1. Remove power from chassis column containing panel assembly according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Put on antistatic wrist strap and connect it to chassis ground.

CAUTION

If quick disconnect valves stick open, or for field use: close hand valves for chassis column supply/return water (next to power distribution box) by turning valve handles clockwise. Be careful not to damage the dewpoint sensor located near the shut-off valves.

3. Wrap absorbent wipers around water hose connectors to catch water that may leak when disconnecting hoses. Disconnect both water hoses from panel assembly. To release a hose connector, pull back on its outer shell, then pull connector halves apart.

4. Remove covers from current regulator and temperature protect board.

5. In panel cable assembly, unplug connectors between temperature protect board and current regulator board.

6. Unplug connector on right end of temperature protect board. Board remains attached to panel assembly.

NOTE

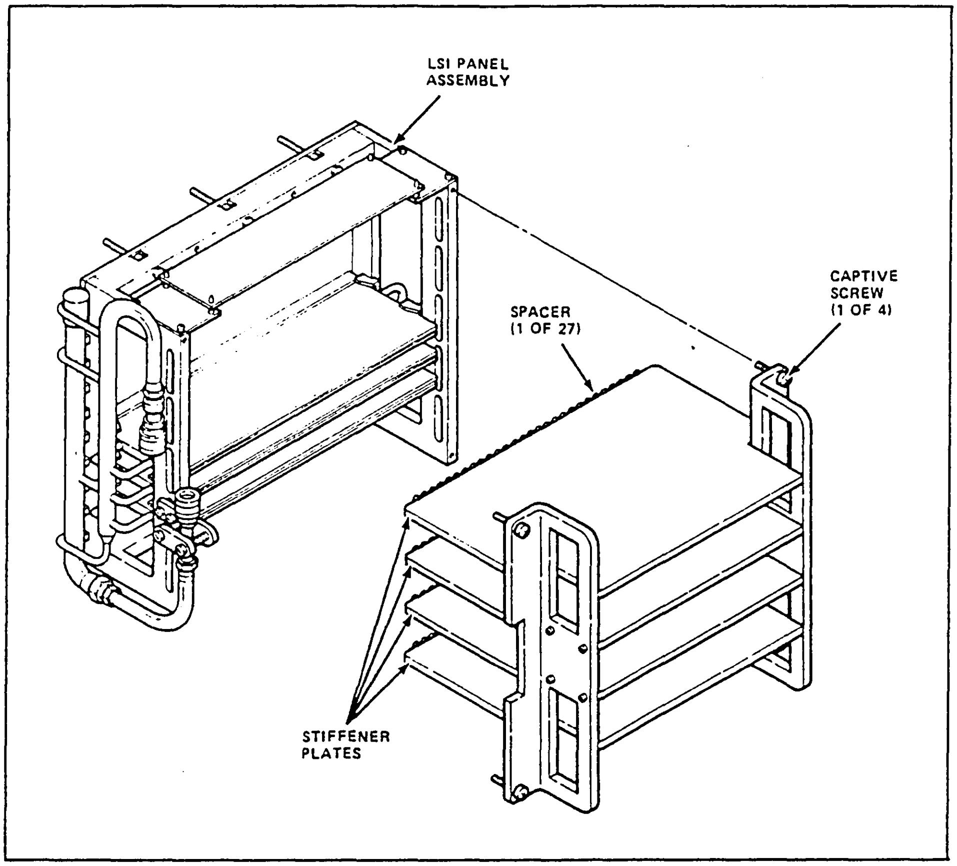
The LSI board stiffener forces a convex bow in the LSI board and is required for panel assembly installation. The stiffener also provides a convenient way to grasp the panel assembly, and may be used during removal as well as installation. When removing panel assembly without installing stiffener, skip steps 7 and 8.

7. To make room for LSI board stiffener, remove auxiliary boards from panel locations B lower, C upper, D lower, E upper, F lower, G upper, H lower, and J upper according to Procedure 7CX00007, Auxiliary Board Removal/Replacement. After removing each board, place it in an antistatic bag.

CAUTION

To avoid damage to screw heads on the board stiffener, use only a number 2 flat-blade screwdriver to tighten the stiffener screws. Do not over-tighten.

8. Install LSI board stiffener on panel assembly using four retained screws on stiffener. Secure stiffener tightly to manifold using a number 2 flat-blade screwdriver in screw head slots.

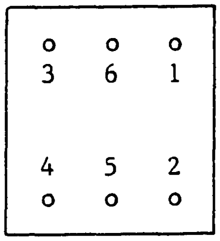


LSI Board Stiffener

CAUTION

Use extreme care when unscrewing the jackscrews that mount the panel assembly to the coax block. Uneven loosening of jackscrews may damage the LSI board.

9. Using drive socket wrench with 6-in extender and 5/16-in socket, loosen each hex-head jackscrew one or two screw-turns at a time using jackscrew loosening sequence. Continue until all jackscrews are free of coax block. Jackscrews remain in panel assembly.



Jackscrew Loosening Sequence

WARNING

A panel assembly with many auxiliary boards weighs more than 20 kg (44 lb), and requires two persons to lift it.

10. Pull panel assembly straight out until it clears guide pins. Place panel assembly in antistatic box.

11. Remove four screws that fasten lead-in board to chassis.

12. Unseat upper-left and lower-right corners of lead-in board from white plastic guide pins on power bus board. Raise each corner slightly to free it from guide pin.

13. Pull lead-in board off guide pins and lift it straight out.

14. Disconnect wrist strap from chassis ground. Carry box containing panel assembly to work surface fitted with antistatic pad connected to raised-floor grid ground.

15. Connect wrist strap to antistatic pad on work surface. Remove panel assembly from its box and place panel assembly on antistatic pad.

REPLACEMENT

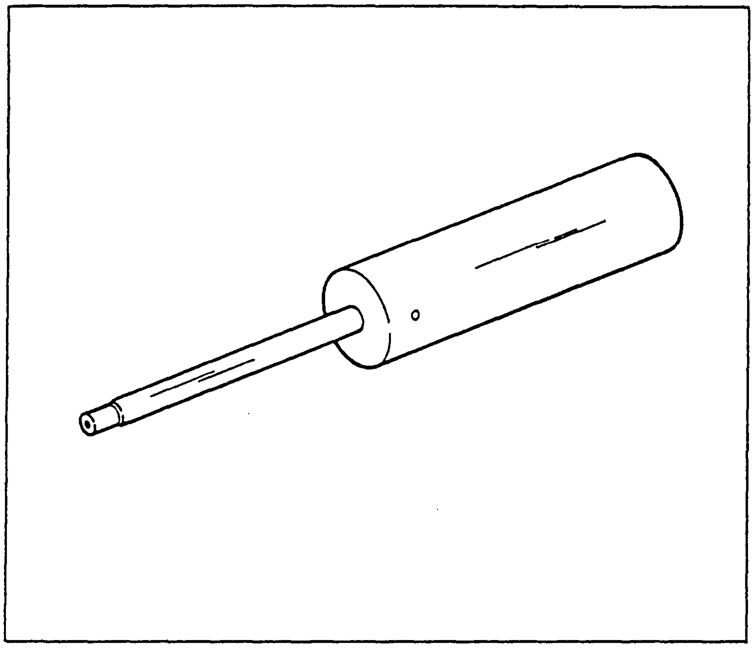
During replacement, it is important to insert the panel as uniformly as possible to prevent damage to male coax pins and mating contacts. Be careful to tighten jackscrews exactly as described.

1. Put on antistatic wrist strap and connect it to antistatic pad on which panel assembly rests.

2. Prepare panel assembly for replacement as follows:

    a. Sight down rows and columns of male coax pins on back of panel assembly to locate bent or missing pins. Use male coax pin straightener to realign bent pins.

    b. If LSI board stiffener is not on panel assembly, install stiffener as described previously in LSI panel removal procedure.



Male Coax Pin Straightener

c. Sight down a horizontal row of male coax pins to ensure stiffener has forced convex curvature in LSI board.

d. Check male coax pin alignment by fitting lead-in board over pins with lettered side of board down and top edge of board at top of panel assembly. Correct pin alignment allows board to slip easily over pins. Straighten pins as necessary.

e. Check male coax pin alignment again by removing lead-in board from panel assembly, turning board so its lettered side is up and bottom edge of board is at top of panel assembly, and fitting board carefully over pins. Correct pin alignment allows board to slip easily over pins. Straighten pins as necessary.

f. Lubricate the threads of each jackscrew with a small amount of LPS lubricant. Use a Q-tip swab to apply the lubricant.

CAUTION

Be careful not to spray lubricant on the panel assembly or the floor. It will make these areas very slippery.

3. Test panel assembly for short circuits as described in Procedure 7CX00015, LSI Panel Current Limit Test.

4. Place panel assembly in antistatic box. Disconnect wrist strap from antistatic pad. Carry box containing panel assembly to equipment in which panel assembly is to be installed.

5. Connect wrist strap to chassis ground.

6. Inspect front of lead-in board for any male coax pins or pin fragments. Remove any pins or pin fragments that are found on the lead-in board.

7. Inspect all coax connectors to make sure they are fully seated (flush with front of power bus board). Reseat any retracted connectors by pushing them inward from behind coax blocks.

8. Transfer lead-in board from panel assembly to power bus board. Press upper-left and lower-right corners of lead-in board tightly onto white plastic guide pins of power bus board. Secure lead-in board with four screws. Verify that lead-in board is flush with power bus board and properly aligned on male coax pin in each corner.

9. Clear all hoses and cables from area to receive panel assembly.

10. Place regulator cable on proper side of manifold.

WARNING

A panel assembly with many auxiliary boards weighs more than 20 kg (44 lb), and requires two persons to lift it.

11. Place the panel assembly on the guide pins (two upper and two lower) that protrude from the rear of the chassis. Slide the panel straight in to prevent binding. Hold the panel in place until the first jackscrew is engaged.

12. Start the upper-right jackscrew (first in sequence) and turn it clockwise for one to one and a half turns after its threads catch. You may have to shift the position of the panel assembly slightly, to align the jackscrews with their mounting holes.

NOTE

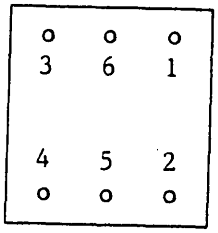
Jackscrew length may vary slightly, and sometimes a second jackscrew must be started to help the first jackscrew to catch.

13. Start lower-right jackscrew (second in sequence) and turn it clockwise for one to one and a half turns after its threads catch.

NOTE

The jackscrew tightening sequence uses a 0 - 5.6 N•m (0 - 50 lbf•in) T-Handle torque wrench adjusted for 4.0 N•m (35 lbf•in).

14. Start jackscrews in the four remaining locations. Then, tighten each jackscrew, one to two turns at a time, in the order shown in the jackscrew tightening sequence diagram. Watch to see that the upper and lower guide pins protrude through the LSI panel by similar amounts. Continue the tightening sequence until all six jackscrews are snug.



Jackscrew Tightening Sequence

15. Torque each jackscrew to 4.0 N•m (35 lbf•in) using the same tightening sequence. The sequence is complete when all six jackscrews have been torqued to 4.0 N•m (35 lbf•in).

NOTE

As a periodic check, the break-away torque should be checked (using a special break-away torque wrench). The break-away torque should be in the range, 3.2 N•m (28 lbf•in) through 3.6 N•m (32 lbf•in).

16. Remove the LSI board stiffener from the panel assembly by loosening four captive screws. Replace auxiliary board, if applicable. Recheck the six jackscrews for a proper torque of 4.0 N•m (35 lbf•in).

17. Torque each jackscrew again to 4.0 N•m (35 lbf•in) using the same tightening sequence.

18. If you suspect LSI panel is causing a contact engagement problem, test and record panel flatness according to Procedure 7CX00069, LSI Flatness Test.

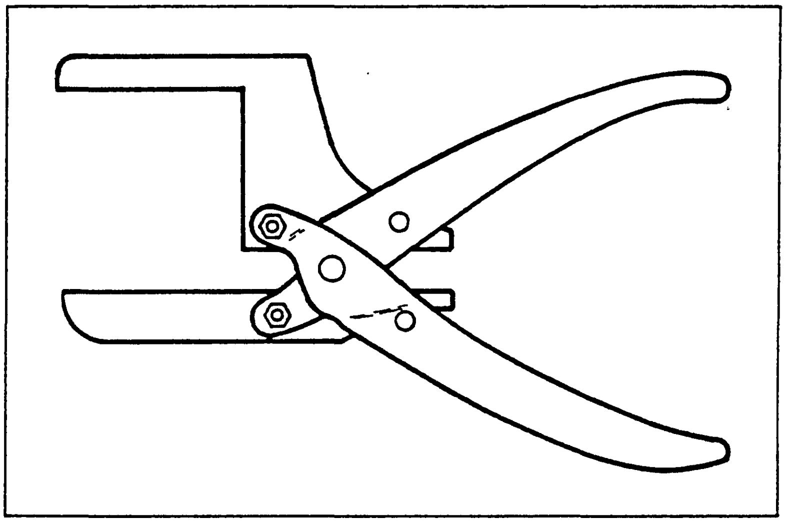
19. If auxiliary boards have been removed from panel assembly, remove each board from its antistatic bag and install it according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.

20. Plug connectors back into right and left ends of temperature protect board. Restore cable connection between temperature protect board and current regulator board.

NOTE

If the quick-disconnect coupling appears to be binding, lubricate the O-ring on the receptacle portion of the coupling with LPS lubricant. Apply the lubricant using a Q-tip swab.

21. Reconnect two water hoses to panel assembly using water hose quick-disconnect pliers.



Water Hose Quick-Disconnect Pliers

22. Open hand valves for chassis column supply/return water by turning valve handles counter-clockwise (standard 1x4 columns only).
23. Inspect chassis column for water leaks. Correct any leaks.
24. Replace covers on current regulator and temperature protect board.
25. Disconnect wrist strap from chassis ground.
26. Test for chassis column short circuits according to Procedure 7CX00010, Chassis Column Current Limit Test.

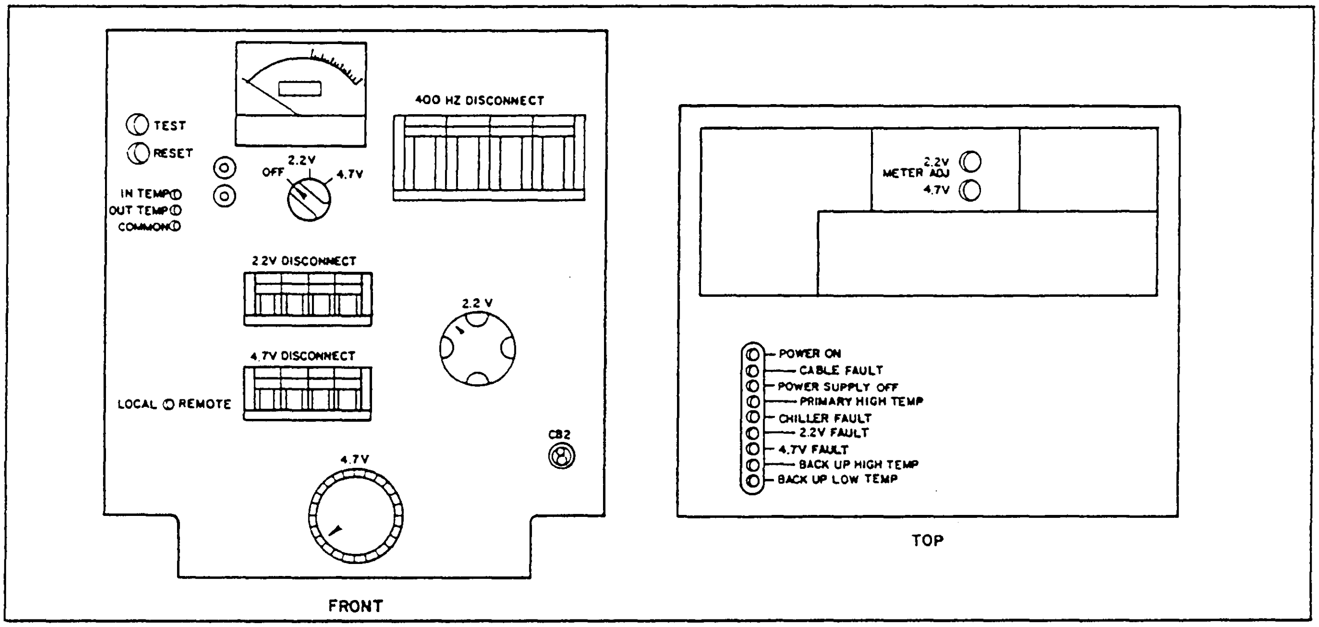
PROCEDURE 7CX00009-A

CHASSIS COLUMN POWER REMOVAL/APPLICATION

Sheet 1 of 1

INTRODUCTION

Before replacing components mounted in a chassis column, you must remove power from the column. Power controls are located on the power distribution (PD) box at the base of each column. Use the following procedures to remove and apply power in a chassis column.



Power Distribution Box Controls and Indicators

REMOVING POWER

1. Set LOCAL/REMOTE switch to LOCAL.
2. Set 400 Hz DISCONNECT circuit breaker to OFF.

APPLYING POWER

1. Set LOCAL/REMOTE switch to LOCAL.
2. Set 400 Hz DISCONNECT circuit breaker to ON. Observe that POWER SUPPLY OFF indicator on PD box is on and that all other PD box indicators are off. If chassis column contains LSI panels, observe that PW (power) LED on regulator board (below each panel assembly) is on.
3. If POWER SUPPLY OFF indicator is on, press RESET switch. POWER SUPPLY OFF indicator goes off and POWER ON indicator on top of PD box lights.
4. If required by site, set LOCAL/REMOTE switch to REMOTE.

Supplement for: AD112-C, AD113-A
Date: 01/02/85
Revision: A

SUPPLEMENTAL INFORMATION

This supplement sheet lists the maximum current values for each chassis column. Use these values when performing the current limit test that begins on sheet 1.

CURRENT LIMITS FOR INDIVIDUAL CHASSIS COLUMNS

NOTE

Maximum current values are valid only when all LSI panel assemblies are present and fully populated.

Current Limits for Individual LSI Chassis Columns

Chassis Column	-2.7 V Test		-4.7 V Test	
	Nom A	Max A	Nom mA	Max mA
Col 1	1.0	1.4	270	330
Col 2	2.2	2.9	250	350
Col 3	2.2	2.9	400	600

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263451	Lambda Model LQ530 current-limited power supply
12263279	John Fluke Model 8020A digital multimeter
Make locally	10-gauge stranded wire leads with 10-gauge solid wire probe tips

INTRODUCTION

This procedure tests for short circuits in a chassis column. During the test, you use a Lambda LQ-530 current-limited power supply to apply fixed voltages to bus bars in the column, then measure the resulting maximum currents. Since testing occurs after repairing a chassis column but before applying power to the column again, the procedure assumes power is removed from the column.

NOTE

Probe wires must be at least 10-gauge wire or larger. Smaller gauge wires introduce too much resistance into the test configuration. Use the probe wires listed under required items for this procedure.

TEST PROCEDURE

1. Ensure power is removed from chassis column.
2. Connect one 10-gauge probe wire to positive terminal of Lambda power supply and other 10-gauge probe wire to negative terminal.
3. Apply power to Lambda power supply.
4. Adjust CURRENT LIMITER control one-quarter turn above its minimum setting. This is necessary to obtain voltage output.
5. Adjust output voltage to +0.50 V. Since meter on Lambda power supply displays only to nearest 0.1 V, use Fluke multimeter to adjust voltage to exactly +0.50 V.

6. Test the probe wires (to ensure that they have low resistance) by shorting the tips together and adjusting the CURRENT LIMITER control to its maximum setting. For 14 A Lambda power supply with output voltage set at +0.50 V, the current reading should be approximately 10 A.

7. Adjust Lambda power supply for a current output of 0 mA.

8. Connect wire from Lambda power supply positive terminal to column chassis ground.

9. Connect wire from Lambda power supply negative terminal to -2.7 V bus (vertical, blue-clad bus at left of column when viewed from rear).

10. Turn CURRENT LIMITER control on Lambda power supply until test current reaches maximum current value for chassis column, or until current stops increasing. Any current greater than maximum current indicates short circuit.

11. Adjust Lambda power supply for a current output of 0 mA.

12. Connect wire from Lambda power supply negative terminal to -4.7 V bus (at right of column when viewed from rear).

13. Perform steps 10 and 11 for -4.7 V bus.

14. Disconnect wires from chassis column and test equipment. Remove power from Lambda power supply.

15. Correct any short circuits. Verify repairs by repeating this test.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
Make locally	Hand-held electrode
Local supply	20/30-V, current-limited ohmmeter

INTRODUCTION

This procedure tests the performance of an antistatic wrist strap and its grounding cord. The procedure requires the following items:

- An electrode for the person wearing the wrist strap to hold. A 3-in (75-mm) length of #304 stainless steel round stock 1 in (25 mm) in diameter is suitable. Attach a banana plug receptacle or screw connector to one end of the electrode.

- An ohmmeter capable of measuring high resistance (0-100 megohms) with enough voltage to overcome skin resistance. Suggested meters include the Simpson Model 269 (20 V at 0.2 uA) and the Triplett Model 630PL (30 V at 0.3 uA).

TEST PROCEDURE

1. Put on antistatic wrist strap.

2. Attach ground lead of ohmmeter to banana plug end of wrist strap grounding cord.

3. Attach positive lead of ohmmeter to electrode.

4. Holding electrode in hand, rotate wrist to simulate normal working motion while observing resistance measurement on meter. Hold metal tab on wrist strap away from wrist to ensure metal fibers in strap are being tested without benefit of tab. Resistance must be greater than 0.5 megohm but less than 10 megohms. At 10-megohm level, wearer generates less than 10 V from capacitive change or friction-generated means. The 0.5 megohm level provides adequate current limiting protection for wearer.

5. If resistance value is too high or low, check wrist strap and grounding cord separately to locate cause.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
00217372	Antistatic container for LSI panel assembly
12263495	Antistatic work pad
75447668	Antistatic lab coat (size 38)
75447669	Antistatic lab coat (size 42)
75447670	Antistatic lab coat (sizes 44 through 46)

INTRODUCTION

Static-sensitive parts include most semiconductor devices and assemblies containing them. Follow these procedures to avoid destroying parts by static discharge.

PART REMOVAL/REPLACEMENT

1. Before removing part, obtain antistatic bag or container in which to place part.
2. Put on antistatic smock and wrist strap. Connect grounding cord to equipment ground and to wrist strap.
3. Remove part and place it in antistatic bag or container before removing wrist strap.

PART HANDLING AT REPAIR STATION

1. Place part, in antistatic bag or container, on work surface fitted with antistatic pad connected to raised-floor grid ground.
2. Put on antistatic wrist strap and connect wrist strap grounding cord to repair station ground.
3. Sit at repair station.
4. Remove part from antistatic bag or container.
5. After repairing part, replace it in antistatic bag or container before removing wrist strap.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
51730100	Safety glasses
00219510	52-pin spring clip removal tool
00219509	48-pin spring clip removal tool
00213164	Array/half-pak array removal tool
52806385	Array insertion tool
00219313	Half-pak array insertion tool (3/8-in diameter nylon stick, approximately 8-in long)
00219884	Array installation tool (magnetized)

REFERENCES

This procedure references the following procedures:

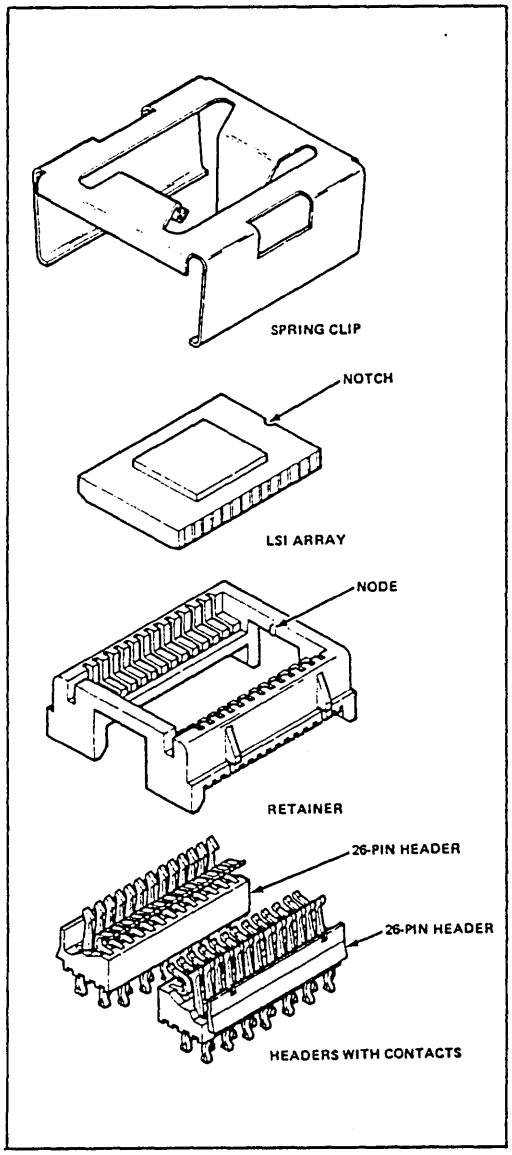
7CX00009	Chassis Column Power Removal/Application
7CX00016	Spring Clip Tool Setup
7CX00007	Auxiliary Board Removal/Replacement

NOTE

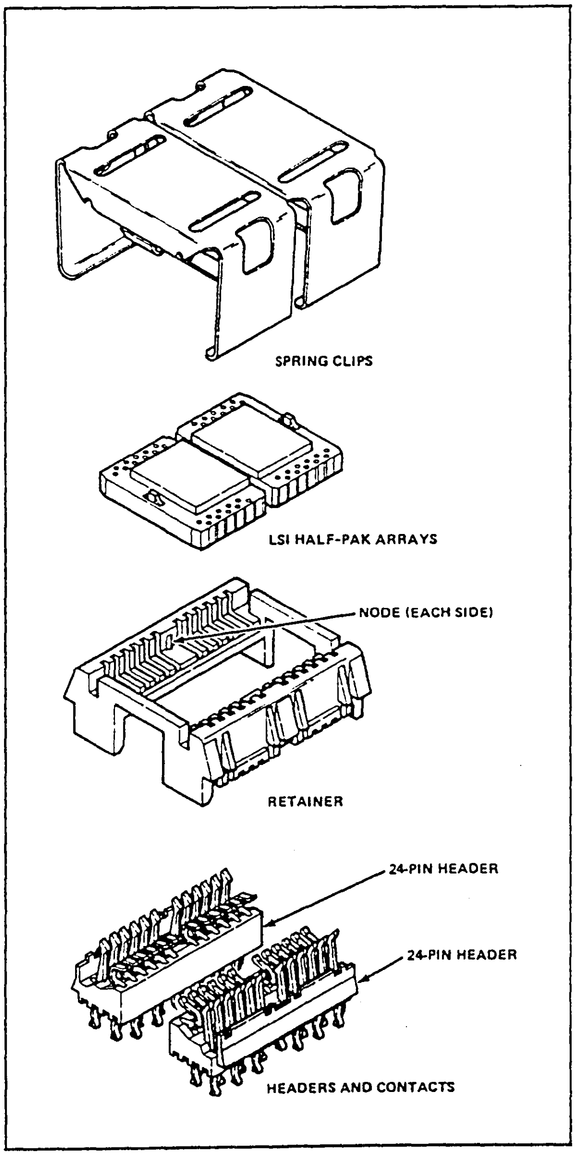
Three types of array installation/insertion tools are described in this procedure. Tool #00219884 (magnetized) is the new style tool and is used to install both full and half-pak arrays. Two old style tools, #52806385 and #00219313, are used to install full and half-pak arrays, respectively.

INTRODUCTION

Each LSI array mounts in a 52-pin connector assembly that connects the array to the LSI panel while allowing the array to touch a cold tube. A single spring clip holds the array in the connector assembly. LSI half-pak arrays mount like full arrays, except two half-pak arrays, each with its own spring clip, fit into a 48-pin connector assembly.



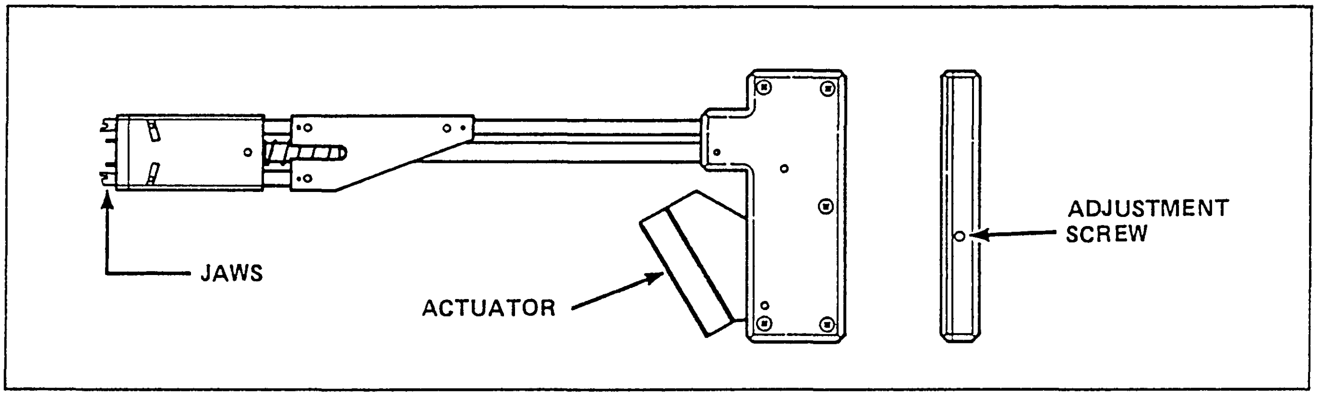
Array and Mounting Hardware



Half-Pak Array and Mounting Hardware

Spring clip removal and replacement requires a spring clip removal tool. There are two versions of the tool: one for full array spring clips and the other for half-pak array spring clips. The tools are similar, except the half-pak tool has narrower spreader jaws and is marked 48-PIN.

This procedure assumes spring clip removal tools are calibrated properly. Procedure 7CX00016, Spring Clip Tool Setup, describes how to test a spring clip removal tool for proper calibration.



Spring Clip Removal Tool

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

REMOVAL

1. Remove power from chassis column containing array or half-pak array to be removed according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Put on antistatic wrist strap and connect it to chassis ground.

WARNING

Wear safety glasses when removing or replacing spring clips.

NOTE

If the array or half-pak array to be removed is next to an auxiliary board, remove the board according to Procedure 7CX00007, Auxiliary Board Removal/Replacement before trying to remove the spring clip. After removing the auxiliary board, place it in an antistatic bag.

If the array or half-pak array to be removed is in the bottom row (row K) of the panel, remove the cover on the LSI panel current regulator before trying to remove the spring clip.

CAUTION

Use extreme care when placing the spring clip removal tool on the spring clip to avoid damaging the connector assembly.

3. Place spring clip removal tool on spring clip, making sure both sides of tool are inserted equally into clip openings.

4. Align tool straight out from LSI panel.

CAUTION

Use extreme care when removing the spring clip to avoid damaging the connector assembly.

5. Push tool straight toward LSI panel until spring clip touches panel. On an LSI array, force required is approximately 130 N (30 lbf). On an LSI half-pak array force required is approximately 75 N (17 lbf).

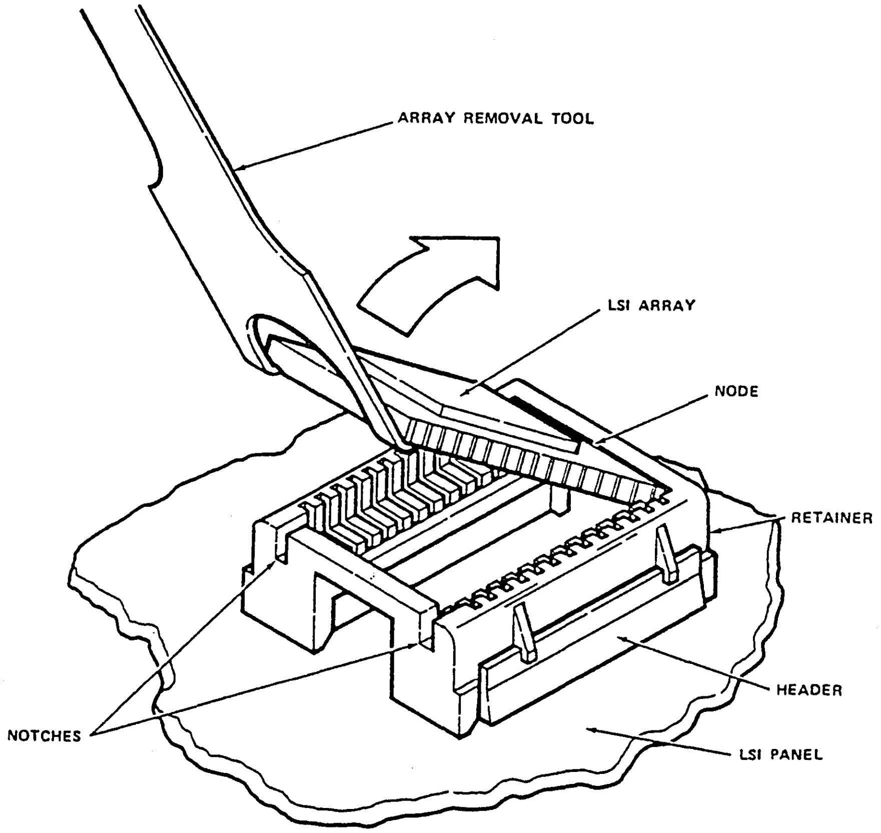
6. While maintaining force towards panel, slowly squeeze tool actuator making sure both sides of clip are caught on tool.

7. With tool actuator still squeezed, slowly withdraw tool and spring clip from connector.

8. Release pressure on actuator to remove spring clip from tool.

9. Lift and remove LSI array or half-pak array from connector assembly using array removal tool.

10. Place array or half-pak array in antistatic bag.



NOTE:

AN LSI HALF-PAK CONNECTOR ASSEMBLY HAS NOTCHES ON EACH SIDE OF ITS RETAINER TO PERMIT LIFTING OF EACH HALF-PAK WITH THE ARRAY REMOVAL TOOL.

Array Removal Tool

REPLACEMENT

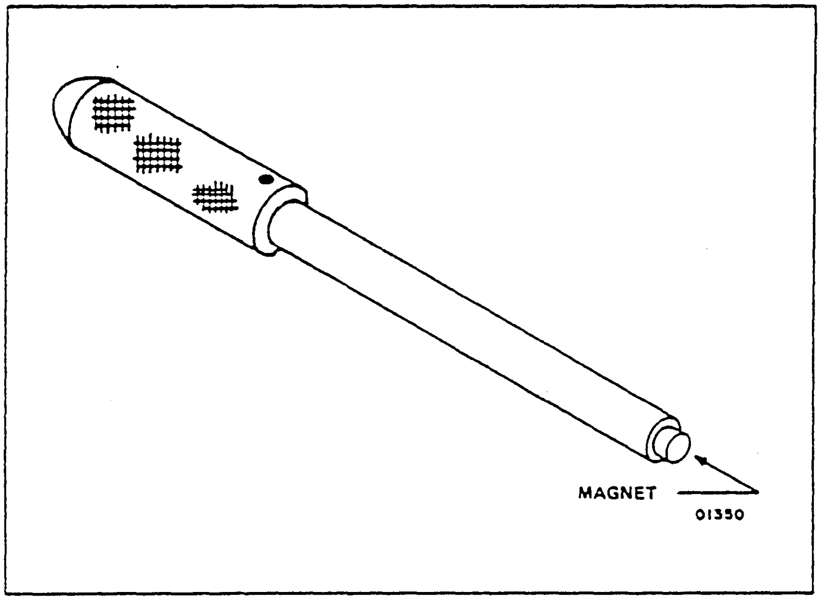
Replacement consists of reversing the removal procedure except for the following items.

1. Make sure array or half-pak array is correctly oriented when placing it in its connector. Align notch on array or half-pak array with tab on retainer.

CAUTION

Use proper tools and techniques to keep array or half-pak array parallel to connector during insertion. Otherwise, inner pins may catch in test point holes and be pushed into side pins, causing short circuits.

2. If using a new style installation tool, perform following substeps:



Array Installation Tool (Magnetized)

   a. Place full or half-pak array on grounded antistatic pad.

   b. Touch array installation tool magnet to gold heat sink in center of array. Magnet holds array on tool.

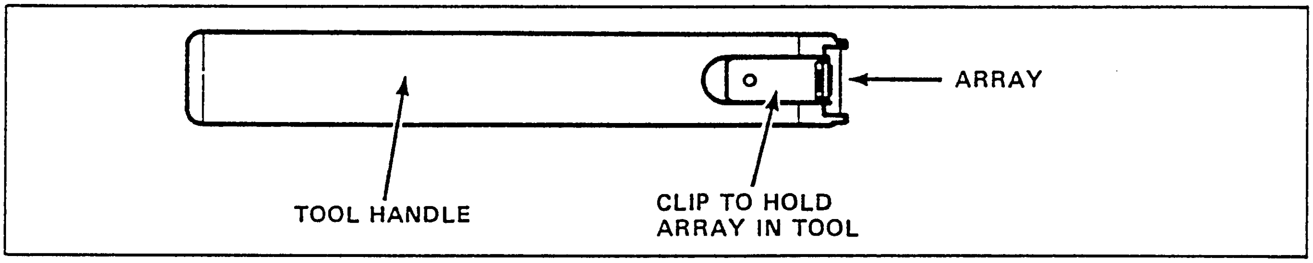
   c. Hold tool perpendicular to LSI panel and carefully push array into connector.

   d. Rock tool slightly to break magnetic bond. Withdraw tool.

3. To insert array in connector using old style array insertion tool, perform following substeps:

   a. Place array in array insertion tool with array heat sink toward tool.

   b. Holding tool perpendicular to LSI panel, carefully push array into connector. Withdraw tool.



LSI Array Insertion Tool

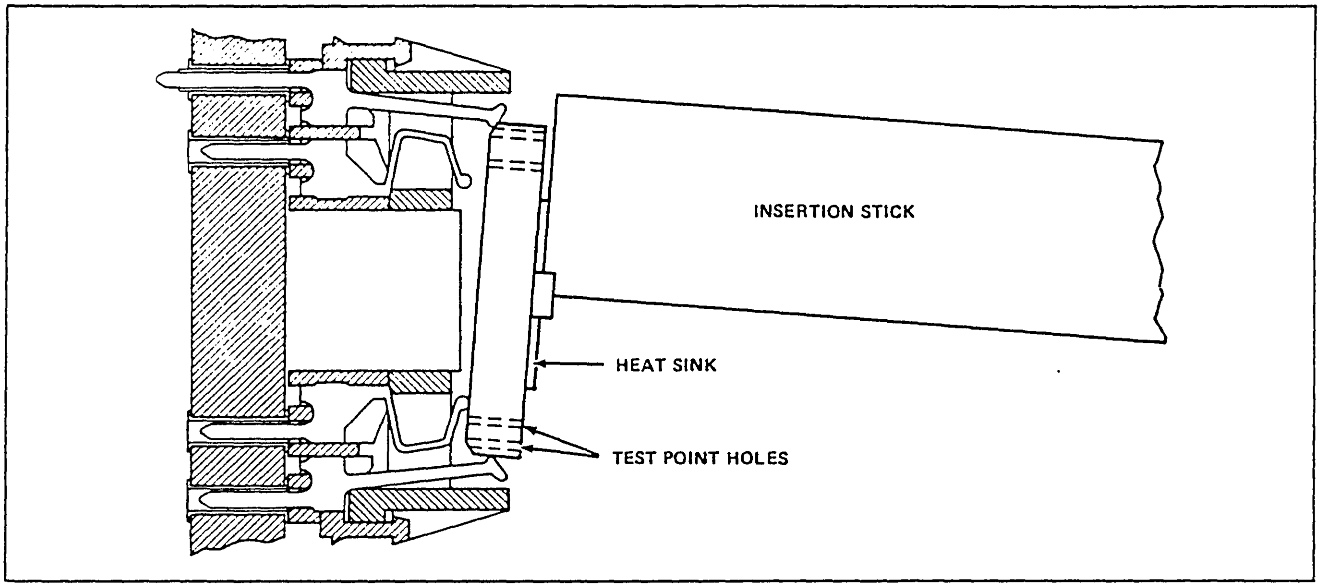
4. To insert half-pak array in connector using old style insertion tool, perform following substeps:

   a. Gently place half-pak array in retainer with bottom of half-pak array resting on lower row of side contact pins and top of half-pak array touching upper row of side contact pins just enough to keep half-pak array in place.

   b. Place insertion stick (3/8-in diameter nylon rod 8-in long) on upper half of gold heat sink, centered on half-pak array from left to right and perpendicular to half-pak array.

   c. Push on stick until upper edge of half-pak array snaps in place.

   d. Center stick on gold heat sink. Push on stick perpendicular to LSI panel assembly to straighten half-pak array.



Half-Pak Array Insertion

CAUTION

Make sure the array or half-pak array is bottomed against the cold tube. Otherwise, the black plastic retainer on the connector may crack when you release the spring clip.

5. Install spring clip as follows:

   a. Place spring clip on spring clip removal tool. Squeeze tool actuator until it stops.

   CAUTION

   Use extreme care when installing the spring clip to avoid damaging the connector assembly.

   b. Carefully place spring clip over connector. With tool actuator still squeezed, push spring clip toward panel until clip touches panel.

   c. Maintaining pressure toward panel, slowly release tool actuator while ensuring that spring clip catches both sides of header.

   d. Carefully withdraw tool from spring clip.

   e. Push against spring clip with thumb to ensure clip is fully seated on header.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
12263279	John Fluke Model 8020A digital multimeter
Local supply	Two No. 10 hex nuts
Local supply	1/4-in open-end wrench
Local supply	3/8-in open-end wrench
00219793	Power bus board removal tool
Local supply	Plastic-head hammer
00219312	Power bus board tapper

REFERENCES

This procedure references the following procedures:

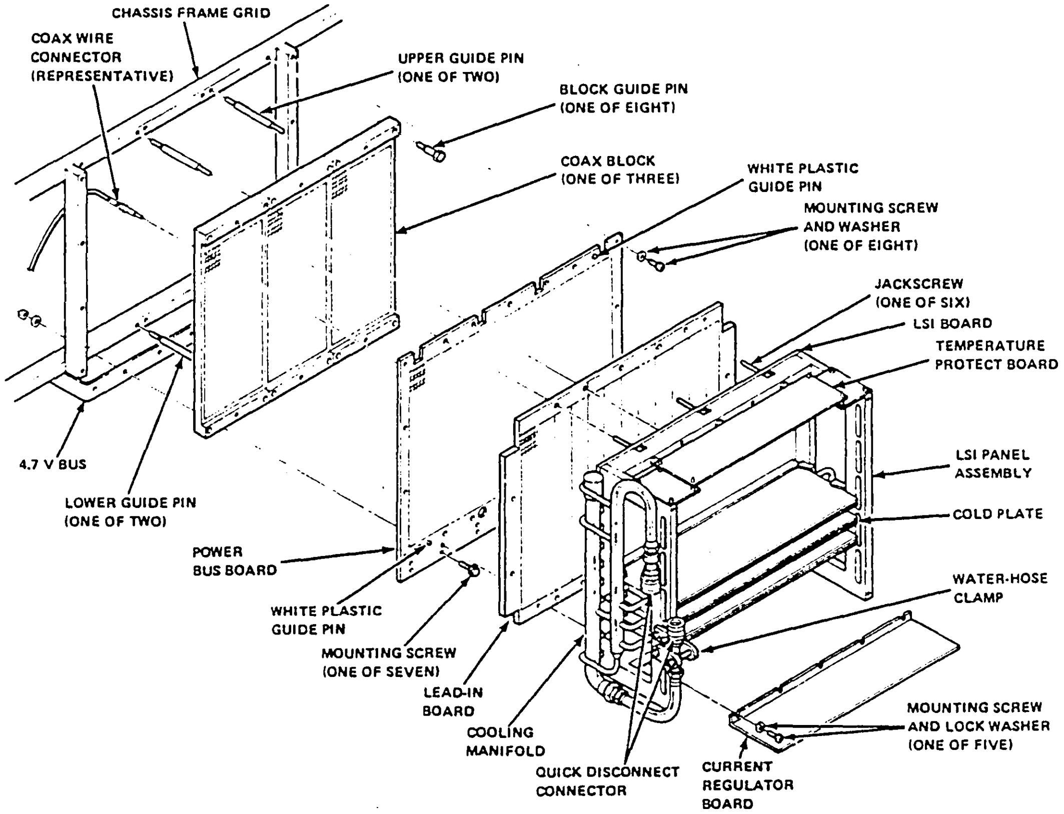
7CX00008	LSI Panel Removal/Replacement
7CX00017	LSI Panel Current Regulator Board Removal/Replacement.
7CX00010	Chassis Column Current Limit Test

INTRODUCTION

The power bus board mounts behind the LSI panel assembly to transfer power and ground from buses at the rear of the chassis to the panel assembly. Panel assembly male coax pins (assigned to power and ground) plug into the power bus board. The power bus board also aligns coax connectors with panel assembly male coax pins that carry signals.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.


CHASSIS FRAME GRID
COAX WIRE CONNECTOR (REPRESENTATIVE)
UPPER GUIDE PIN (ONE OF TWO)
BLOCK GUIDE PIN (ONE OF EIGHT)
COAX BLOCK (ONE OF THREE)
WHITE PLASTIC GUIDE PIN
MOUNTING SCREW AND WASHER (ONE OF EIGHT)
JACKSCREW (ONE OF SIX)
LSI BOARD
TEMPERATURE PROTECT BOARD
LSI PANEL ASSEMBLY
COLD PLATE
WATER-HOSE CLAMP
MOUNTING SCREW AND LOCK WASHER (ONE OF FIVE)
CURRENT REGULATOR BOARD
QUICK DISCONNECT CONNECTOR
COOLING MANIFOLD
LEAD-IN BOARD
MOUNTING SCREW (ONE OF SEVEN)
WHITE PLASTIC GUIDE PIN
POWER BUS BOARD
LOWER GUIDE PIN (ONE OF TWO)
4.7 V BUS

Power Bus Board Location Between Chassis and Panel Assembly

REMOVAL

1. Remove LSI panel assembly and lead-in board according to Procedure 7CX00008, LSI Panel Removal/Replacement.

2. Remove current regulator board according to Procedure 7CX00017, LSI Panel Current Regulator Board Removal/Replacement.

3. Disconnect bottom of power bus board from -4.7 V bus by using 1/4-in wrench to remove seven screws and washers. Note and label location of wire attached to one screw for later replacement. Labeling of wire is necessary to prevent interchanging it with wire disconnected from regulator board during replacement.

4. Remove four screws and lock washers that fasten power bus board to chassis frame grid.

5. Remove four guide pins from chassis frame grid. To remove guide pin, install two No. 10 nuts on pin and tighten them against each other. Then remove pin and nuts with 3/8-in wrench.

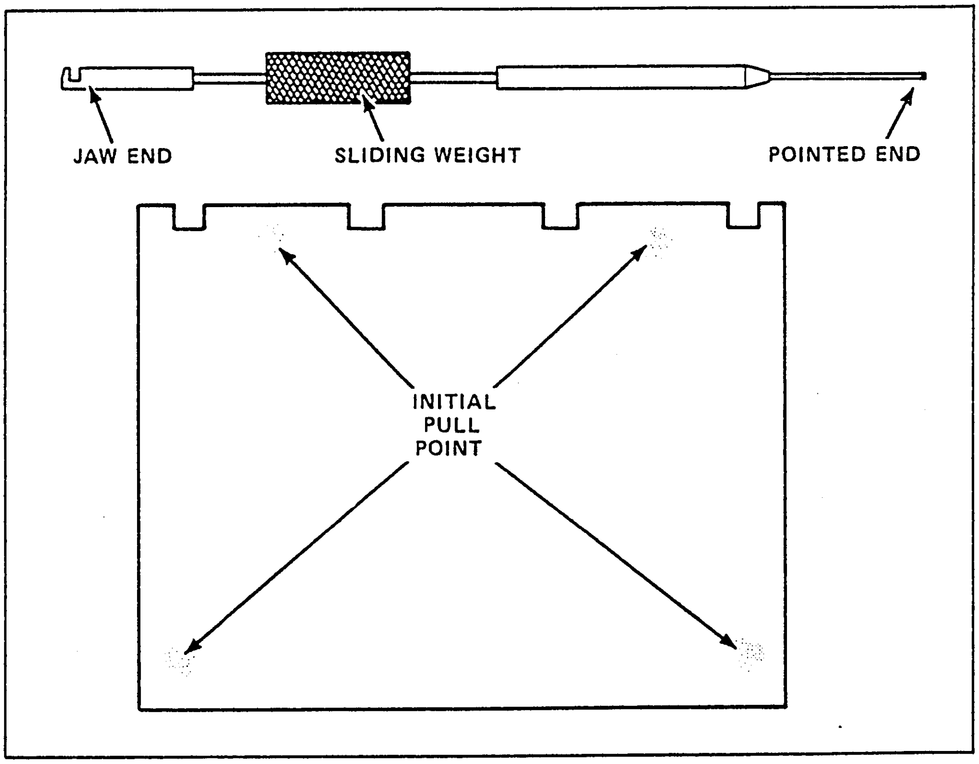
6. Use power bus board removal tool to separate power bus board from chassis. Tool has a sliding weight, a pointed end for pushing board from wire mat side of chassis, and a jaw end for pulling board from LSI panel side of chassis. Often, thickness of wire mat prevents pushing, so power bus board must be removed by pulling only. Separate power bus board from chassis as follows:

   a. If wire mat behind board is dense, go to step b. Otherwise, use pointed end of tool to push gently around perimeter of board until board separates from chassis enough to allow use of jaw end of tool. Then go to step c.

   b. Hook jaw end of tool behind board at a pull point. Operate tool gently until board separates slightly from chassis. Repeat at other three pull points until separation around perimeter of board is enough to clear jaw end of tool.

   c. Work jaw end of tool around perimeter of board and continue to pull gently until board separates from chassis.

7. Lift board from chassis and place board in an antistatic bag.



Power Bus Board Removal Tool and Pull Points

REPLACEMENT

1. Put on antistatic wrist strap and connect it to chassis ground.
2. Remove power bus board from antistatic bag. Inspect bus board for damaged or missing bushings.
3. Install top two guide pins in chassis frame grid with tapered ends out.
4. Insert bottom edge of power bus board between cold bar and coax blocks. Slide power bus board onto top guide pins and against chassis frame grid. Be careful to mate holes in board with coax connector ends.
5. Install bottom two guide pins in chassis frame grid with tapered ends out.
6. Without bending power bus board, install mounting screw with lock washer and flat washer in each corner of power bus board.
7. Using power bus board tapper (2-in diameter plastic rod) and plastic-head hammer, tap lightly on surface of board to seat board on coax blocks. Continue tapping until all coax connectors are fully seated (flush with front of power bus board).
8. Tighten mounting screw in each corner of power bus board.
9. If any coax connectors are not fully seated (flush with front of power bus board), push them inward from behind coax blocks.
10. Connect power bus board to -4.7 V bus with seven mounting screws, washers, and nuts. Also connect labeled wire removed from screw in removal step 3. Remove wire label.
11. With ohmmeter, measure resistance between lug of wire installed in step 10 and plated front surface of power bus board near coax connectors. Ensure that no short circuit exists.
12. Replace current regulator board according to Procedure 7CX00017, LSI Panel Current Regulator Board Removal/Replacement, except do not apply power.
13. Test chassis column for short circuits according to Procedure 7CX00010, Chassis Column Current Limit Test.
14. Replace LSI panel assembly and lead-in board according to Procedure 7CX00008, LSI Panel Removal/Replacement.
15. Again test chassis column for short circuits according to Procedure 7CX00010, Chassis Column Current Limit Test.

Supplement for: AD112C, AD113-A
Date: 01/01/85
Revision: A

SUPPLEMENTAL INFORMATION

This supplement sheet list maximum current values for LSI panel assemblies in each chassis. Use these values when performing the current limit test that begins on sheet 1.

NOTE

Maximum current values are valid only when the LSI panel assembly is fully populated.

Current Limits for LSI Panels

TYPICAL READING		
PANEL	2.2 V	4.7 V
A2	410 - 470 mA	40 - 70 mA
B2	380 - 430 mA	70 - 90 mA
C2	370 - 470 mA	10 - 40 mA
A3	360 - 390 mA	40 - 70 mA
B3	340 - 470 mA	100 - 130 mA
C3	350 - 490 mA	110 - 130 mA
D3	380 - 440 mA	90 - 170 mA

REQUIRED ITEMS

The following items are required to perform this procedure.

Part Number	Item
12263451	Lambda Model LQ530 current-limited power supply
12263279	John Fluke Model 8020A digital multimeter
00217329	Locator board for LSI panel
Make locally	10-gauge stranded wire leads with 10-gauge solid wire probe tips

INTRODUCTION

This procedure tests for short circuits in an LSI panel assembly. During the test, you use a Lambda LQ-530 current-limited power supply to apply fixed voltages to the LSI panel, then measure the resulting maximum currents. You typically perform this test when populating a panel with circuits, before placing a panel in a chassis column, or after making a change to the panel. The most common cause of short circuits is panel rework.

This procedure assumes the LSI panel is resting on an antistatic work pad connected to raised-floor grid ground.

NOTE

Probe wires must be at least 10-gauge wire or larger. Smaller gauge wires introduce too much resistance into the test configuration. Use the probe wires listed under required items for this procedure.

When populating a panel, test for short circuits after populating each row.

TEST PROCEDURE

CAUTION

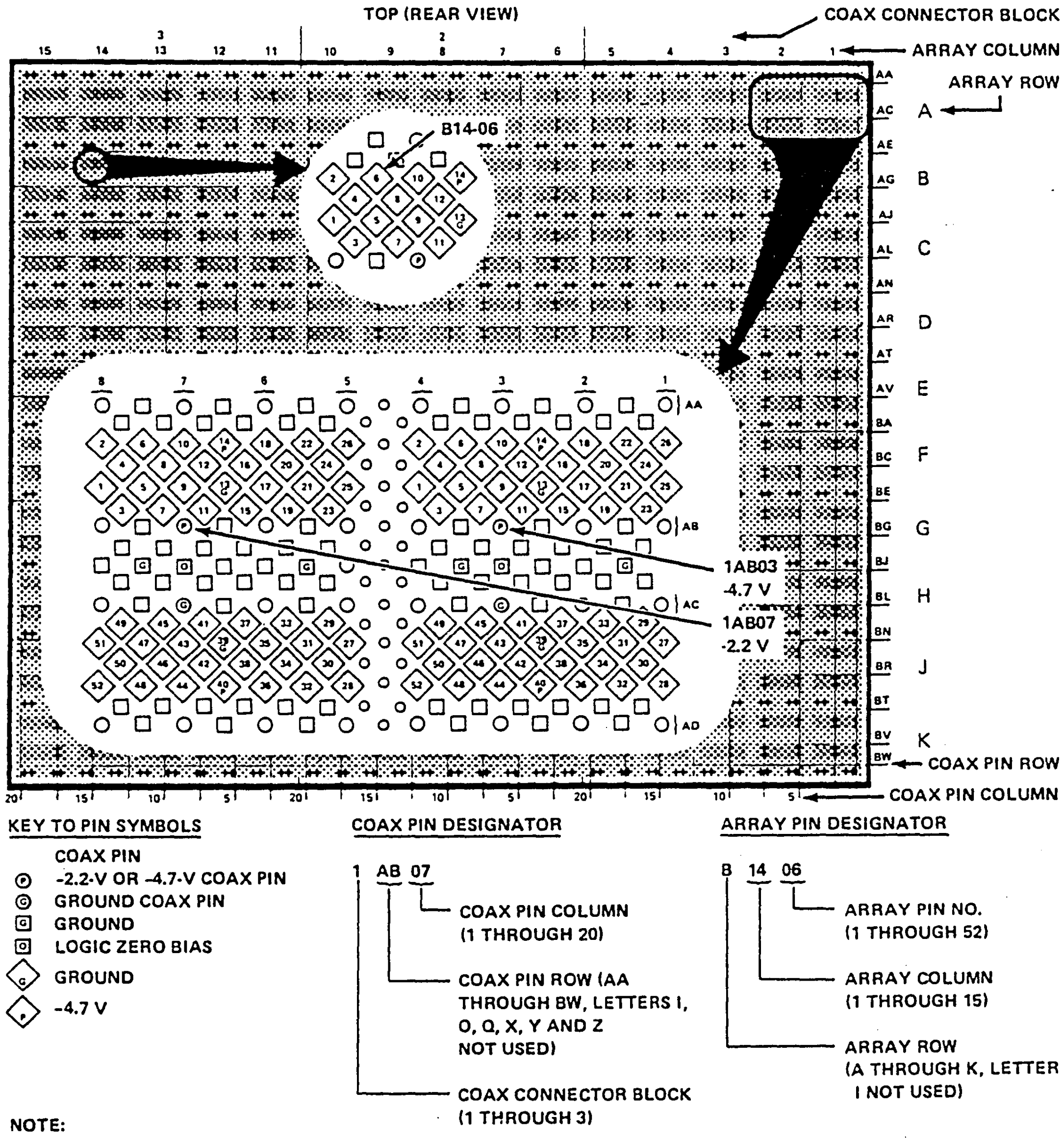
To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

1. Put on antistatic wrist strap and connect wrist strap grounding cord to repair station ground.
2. Turn LSI panel so its male coax pins face upward.
3. Place locator board on rear of LSI panel, making sure top of locator is at top of panel.
4. Connect one 10-gauge probe wire to positive terminal of Lambda power supply and other 10-gauge probe wire to negative terminal.
5. Apply power to Lambda power supply.
6. Adjust CURRENT LIMITER control one-quarter turn above its minimum setting. This is necessary to obtain voltage output.
7. Adjust output voltage to +0.50 V. Since meter on Lambda power supply displays only to nearest 0.1 V, use Fluke multimeter while adjusting voltage to exactly +0.50 V.
8. Test probe wires (to ensure they have low resistance) by shorting probe tips together and adjusting CURRENT LIMITER control to its maximum setting. For 14 A Lambda power supply and output voltage of +0.50 V, current reading should be approximately 10 A.
9. Adjust Lambda power supply for a current output of 0 mA.
10. Connect wire from Lambda power supply positive terminal to panel assembly frame ground.
11. Connect wire from Lambda power supply negative terminal to a -2.2 V power input connection, such as male coax pin 1AB07.
12. Turn CURRENT LIMITER control on Lambda power supply until test current reaches maximum current value for LSI panel, or until current stops increasing. Any current greater than maximum current indicates short circuit.
13. Adjust Lambda power supply for a current output of 0 mA.
14. Move wire from Lambda power supply negative terminal to a -4.7 V power input connection, such as male coax pin 1AB03.

15. Perform steps 12 and 13 for -4.7 V pin.

16. Disconnect wires from LSI panel and test equipment. Remove power from Lambda power supply.

17. Correct any short circuits. Verify repairs by repeating this test.


TOP (REAR VIEW)
COAX CONNECTOR BLOCK
ARRAY COLUMN
ARRAY ROW
B14-06
1AB03
-4.7 V
1AB07
-2.2 V
COAX PIN ROW
COAX PIN COLUMN
AA AC AE AG AJ AL AN AR AT AV BA BC BE BG BJ BL BN BR BT BV BW
A B C D E F G H J K
KEY TO PIN SYMBOLS
COAX PIN
-2.2-V OR -4.7-V COAX PIN
GROUND COAX PIN
GROUND
LOGIC ZERO BIAS
GROUND
-4.7 V
COAX PIN DESIGNATOR
1 AB 07
COAX PIN COLUMN (1 THROUGH 20)
COAX PIN ROW (AA THROUGH BW, LETTERS I, O, Q, X, Y AND Z NOT USED)
COAX CONNECTOR BLOCK (1 THROUGH 3)
ARRAY PIN DESIGNATOR
B 14 06
ARRAY PIN NO. (1 THROUGH 52)
ARRAY COLUMN (1 THROUGH 15)
ARRAY ROW (A THROUGH K, LETTER I NOT USED)

NOTE:

THE -4.7-V AND -2.2-V PINS REPEAT EVERY EIGHT HORIZONTAL AND VERTICAL LOCATIONS, FOR EXAMPLE:

FROM 1AB03, -4.7 V ALSO APPEARS AT 1AB11, 1AB19, 1AK03, AND 1AU03.
FROM 1AB07, -2.2 V ALSO APPEARS AT 1AB15, 1AB23, 1AK07, AND 1AU07.

LSI Panel Pin Designations

REQUIRED ITEMS

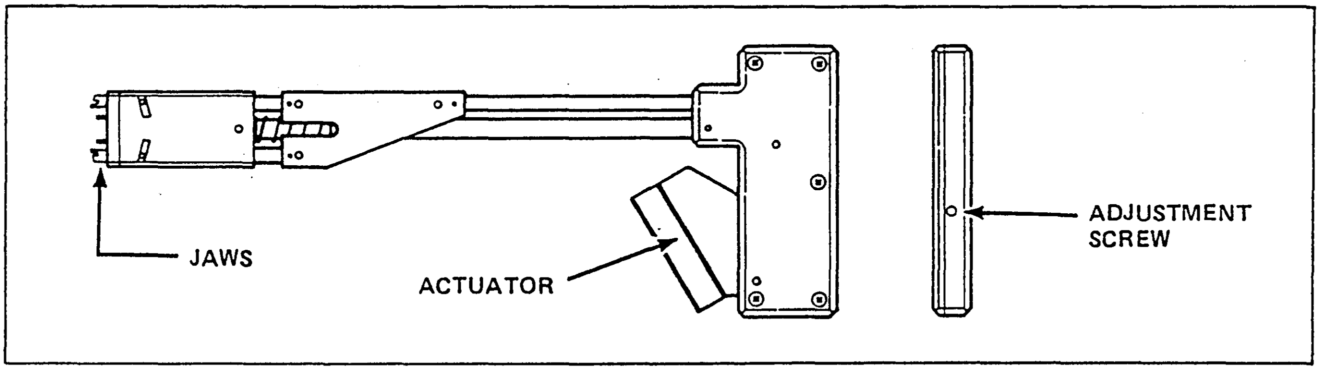
The following items are required to perform this procedure:

Part Number	Item
51730100	Safety glasses
00219510	52-pin spring clip removal tool
00219509	48-pin spring clip removal tool
00218250	Check block for spring clip tool calibration
Local supply	1/16-in Allen key
11896730	52-pin spring clip
22934306	48-pin spring clip
Local supply	3 in 1 oil
Local supply	Silicon cloth or oil-impregnated cloth

INTRODUCTION

There are two versions of the spring clip tool; one for 52-pin (full array) spring clips and the other for 48-pin (half-pak array) spring clips. The tools are similar, except the half-pak tool has narrower spreader jaws and is marked 48-PIN. Squeezing the actuator opens the tool jaws to a position determined by a set screw in the tool handle.

This procedure describes how to lubricate, test, and adjust the tool. Use the same procedure for either version of the tool.



Spring Clip Tool

LUBRICATION

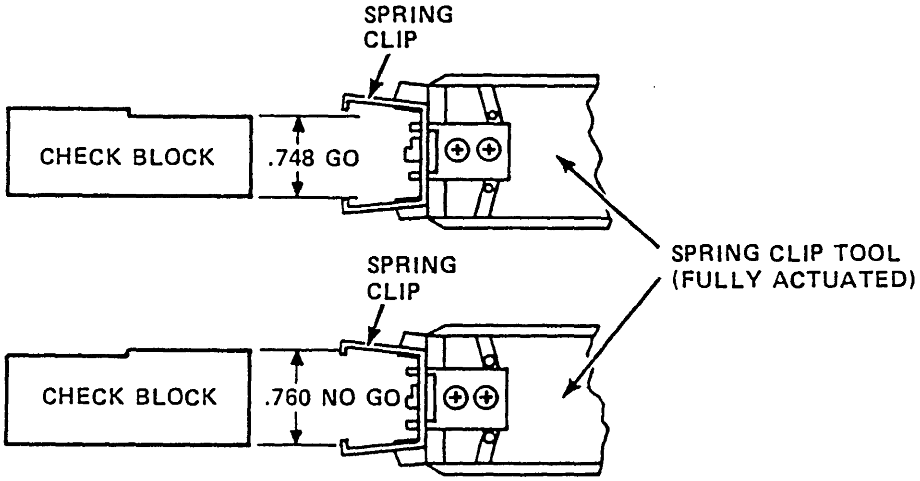
1. If tool is working hard or sticking, apply a drop of 3-in-1 Oil to each roll pin securing jaws in tool. Then apply a light film of oil to steel sliding parts in tool handle.
2. Wipe jaw block with silicon cloth or oil-impregnated cloth to prevent surface rust.

TESTING/ADJUSTMENT

WARNING

Wear safety glasses when working with spring clips.

1. Place spring clip in tool jaws and squeeze actuator fully. GO (0.748 in) end of check block should fit between spring clip legs. NO GO (0.760 in) end of check block should not fit.
2. If spring clip legs are too close together, use 1/16-in Allen key to turn set screw CCW a small amount. Repeat step 1.
3. If spring clip legs are too far apart, use 1/16-in Allen key to turn set screw CW a small amount. Repeat step 1.



Spring Clip Tool Testing

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
51730100	Safety glasses
23004661	Emergency LSI array holder
Local supply	Screwdriver
Local supply	7/16-in open-end wrench

REFERENCE

This procedure references the following procedure:

7CX00013 LSI Array/Half-Pak Array Removal/Replacement

INTRODUCTION

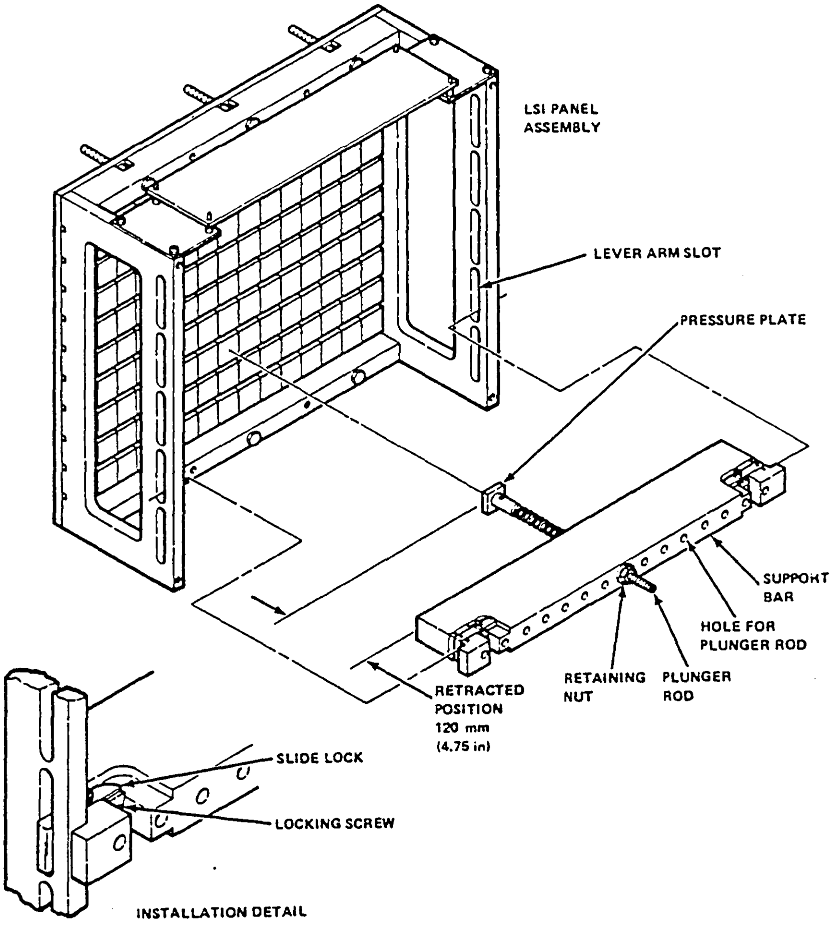
The emergency array holder is a fixture that temporarily replaces the two spring clips on a 48-pin connector assembly or the single spring clip on a 52-pin connector assembly. Such replacement may be necessary if the connector has been damaged and can no longer retain the spring clip(s). The array holder presses the array(s) in the connector and against the cold tube. By moving the plunger rod sideways on the support bar and by moving the support bar up and down on the LSI panel assembly, you can use the fixture at any array location.

WARNING

Wear safety glasses when working with spring clips.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.



LSI Emergency Array Holder

INSTALLATION

1. Put on antistatic wrist strap and connect it to chassis ground.
2. Remove spring clip(s) from damaged connector according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement. Leave array(s) in connector.

3. If connector pins are bent, correct problem before installing array holder.

4. Place plunger rod in support bar hole that corresponds to horizontal location of array(s) to be held in place.

5. Retract plunger rod by pressing it toward support bar and turning up adjustment nut. Bottom of plunger should be no more than 120 mm (4.75 in) from bottom of plunger bar.

6. Mount array holder on front of LSI panel assembly as follows:

   a. Push both slide locks all the way in.

   b. Place array holder in panel assembly so that plunger rod aligns vertically with damaged connector.

   c. Pull both slide locks completely out and lock them in lever arm slots by tightening both locking screws.

   d. Turn pressure plate at end of plunger rod so that its sides are parallel to sides of damaged connector.

7. Release plunger bar to permit pressure plate to contact array(s). To do this, hold slotted end of plunger rod with screwdriver and loosen retaining nut with 7/16-in open-end wrench until all spring force is applied to array(s).

REMOVAL

1. Put on antistatic wrist strap and connect it to chassis ground.
2. Retract plunger until it clears array(s). Do this by holding end of plunger rod with a screwdriver and tightening retaining nut.
3. Loosen both locking screws.
4. Push both slide locks completely in. Lift array holder out of LSI panel assembly.

PROCEDURE 7CX00022-A LSI COAX WIRE CONNECTOR REMOVAL/REPLACEMENT Sheet 1 of 4

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
23004660	Coax wire removal tool
23004600	Coax clip removal tool
00215658	Coax wire insertion tool
24670876	Angled coax wire insertion tool
12259132	Coax extractor (Burndy RX20-25V2)

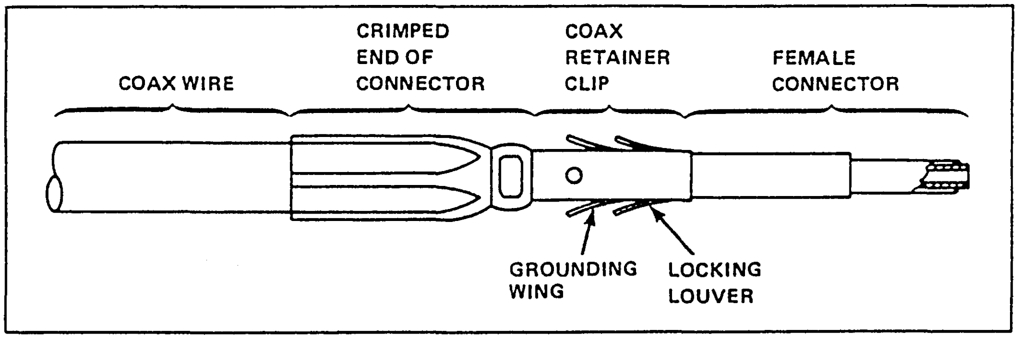
REFERENCES

This procedure references the following procedures.

7CX00009	Chassis Column Power Removal/Application
7CX00010	Chassis Column Current Limit Test
7CX00014	LSI Power Bus Board Removal/Replacement
7CX00025	LSI Board Male Coax Pin Removal/Replacement
7CX00072	LSI Coax Block Hole Repair

INTRODUCTION

A coax wire connector may plug into a coax block (at the rear of the LSI panel assembly) or into a cable connector block. Locking louvers on the connector grip the block.

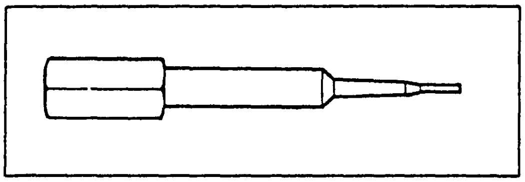


Coax Wire Connector

REMOVAL

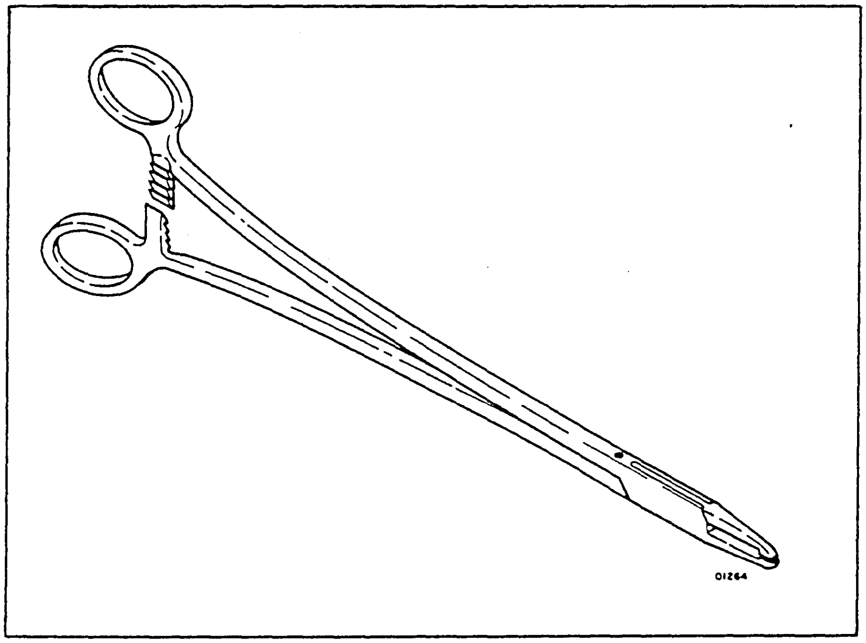
1. Remove power from chassis column you are working on according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. If coax connector to be removed is in cable connector block, push connector out of block with coax extractor. If connector to be removed is in coax block (behind LSI panel), go to step 3.



Coax Extractor

3. Keeping handles of coax removal tool perpendicular to ribs in coax block, grasp coax wire connector with tool. (Grasping connector this way prevents tool from breaking ribs during connector removal.) Twist coax wire connector CCW while pulling it straight out of coax block.



Coax Wire Removal Tool

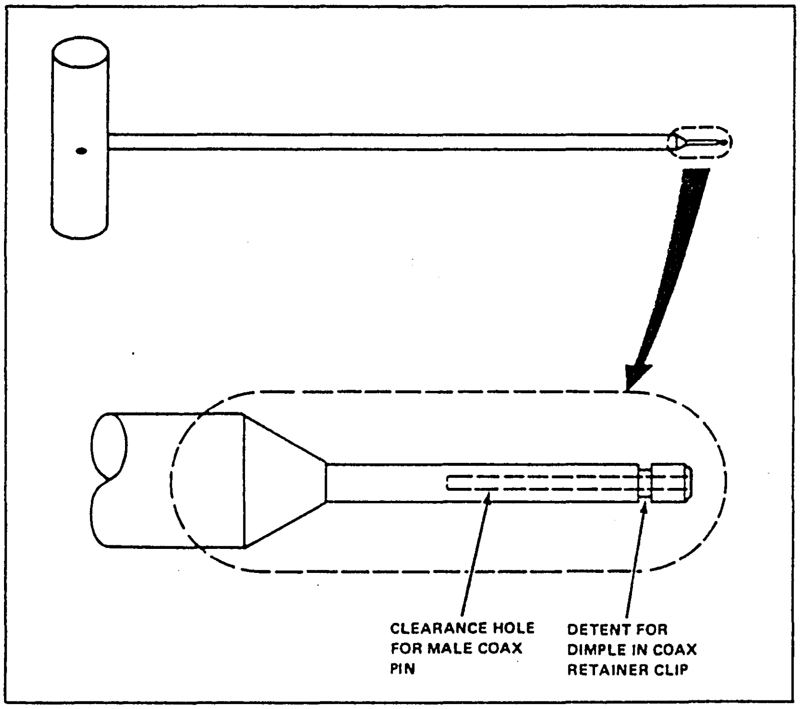
4. Inspect coax wire connector for presence of coax retainer clip. If clip is missing, it is still in coax block. Perform the following substeps only when retainer clip remains in connector block.

CAUTION

When removing a coax retainer clip from a coax block, use care not to damage the male coax pin with the coax clip removal tool.

If coax clip falls between coax block and power bus board, a short circuit may occur between a power pin and ground. Test for a short circuit in the chassis column according to Procedure 7CX00010, Chassis Column Current Limit Test. If necessary, retrieve coax clip by removing power bus board according to Procedure 7CX00014, LSI Power Bus Board Removal/Replacement.

   a. Insert tip of coax clip removal tool straight into coax retainer clip until dimple in clip seats into detent in end of tool. Then pull clip out of block.


CLEARANCE HOLE FOR MALE COAX PIN
DETENT FOR DIMPLE IN COAX RETAINER CLIP

Coax Clip Removal Tool

   b. Do not attempt to replace clip on coax connector of old wire. Obtain a new coax wire for replacement.

5. Inspect male coax pin by looking into coax block. If pin is damaged, replace it according to Procedure 7CX00025, LSI Board Male Coax Pin Removal/Replacement.

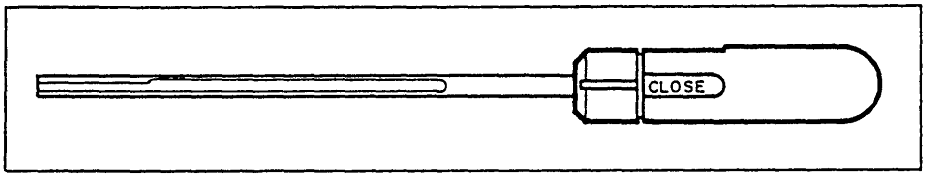
REPLACEMENT

NOTE

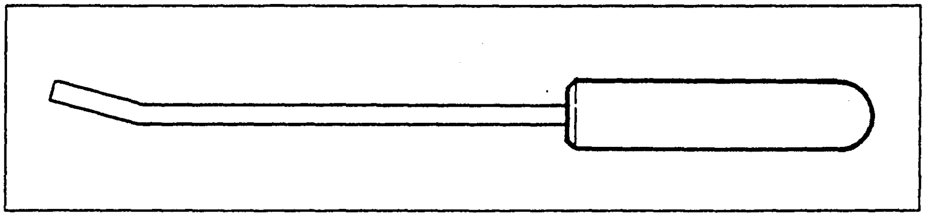
When reinserting an old wire, always replace the clip on the coax connector with a new one.

1. Insert coax wire connector straight and without twisting into coax block or cable block either by hand or with aid of coax wire insertion tool.

2. Test connector retention by pulling on coax wire with moderate force. If connector pulls out of block, install a new wire and retest connector retention. If poor retention is caused by damaged hole in coax block, repair hole according to procedure 7CX00072, LSI Coax Block Hole Repair.



Coax Wire Insertion Tool



Angled Coax Wire Insertion Tool

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
00213354	Insertion press (including small aluminum shims)
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263495	Antistatic work pad
Local supply	Miscellaneous hand tools (for retainer removal)
Local supply	Soldering tools
00205366	Broken pin removal tool kit
Local supply	Plastic-head hammer
Local supply	Double-backed tape
00216074	LSI 48/52-pin connector resizing tool

REFERENCES

This procedure references the following procedures.

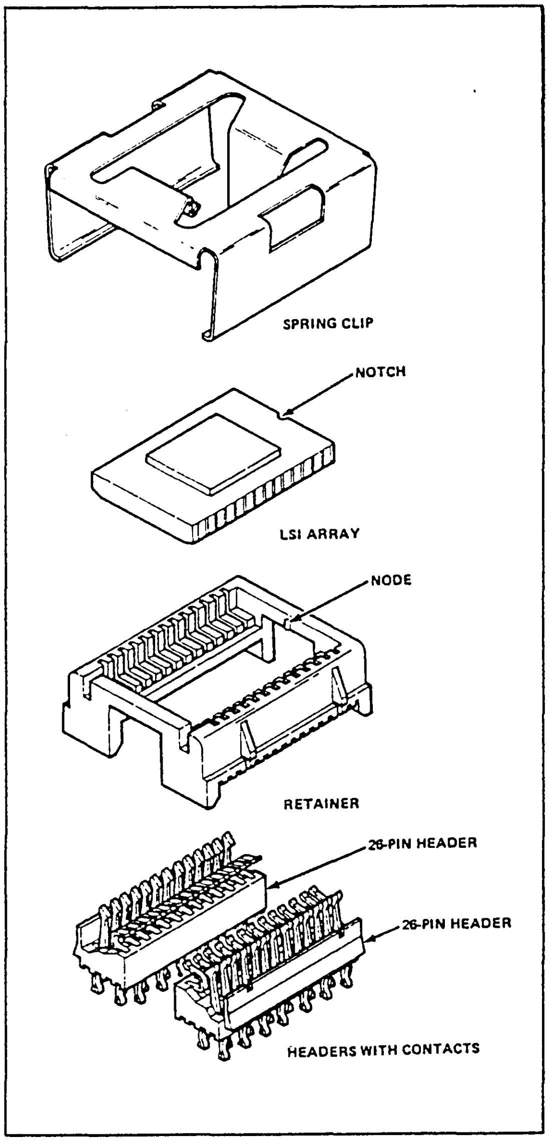
7CX00026	LSI Board 48/52-Pin Connector Pin Removal/Replacement
7CX00008	LSI Panel Removal/Replacement
7CX00013	LSI Array/Half-Pak Array Removal/Replacement
7CX00015	LSI Panel Current Limit Test

INTRODUCTION

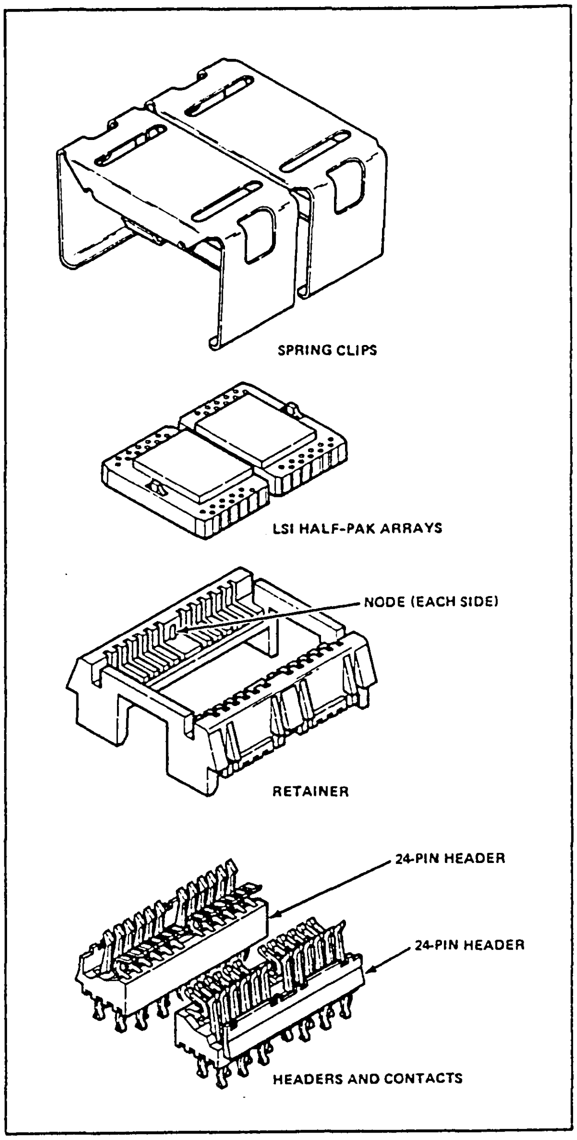
LSI half-pak array connectors use 24-pin headers and LSI array connectors use 26-pin headers. Each connector contains two headers that mount on the front of the LSI panel. Refer to Procedure 7CX00026, LSI 48/52-Pin Connector Pin Removal/Replacement for a more detailed description of connector headers, pins, and related parts. Removal/replacement procedures for 24-pin and 26-pin headers are the same.

NOTE

Header replacement requires an insertion press. Do not start the removal procedure unless you have a press.



26-Pin Headers and Related Parts



24-Pin Headers and Related Parts

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

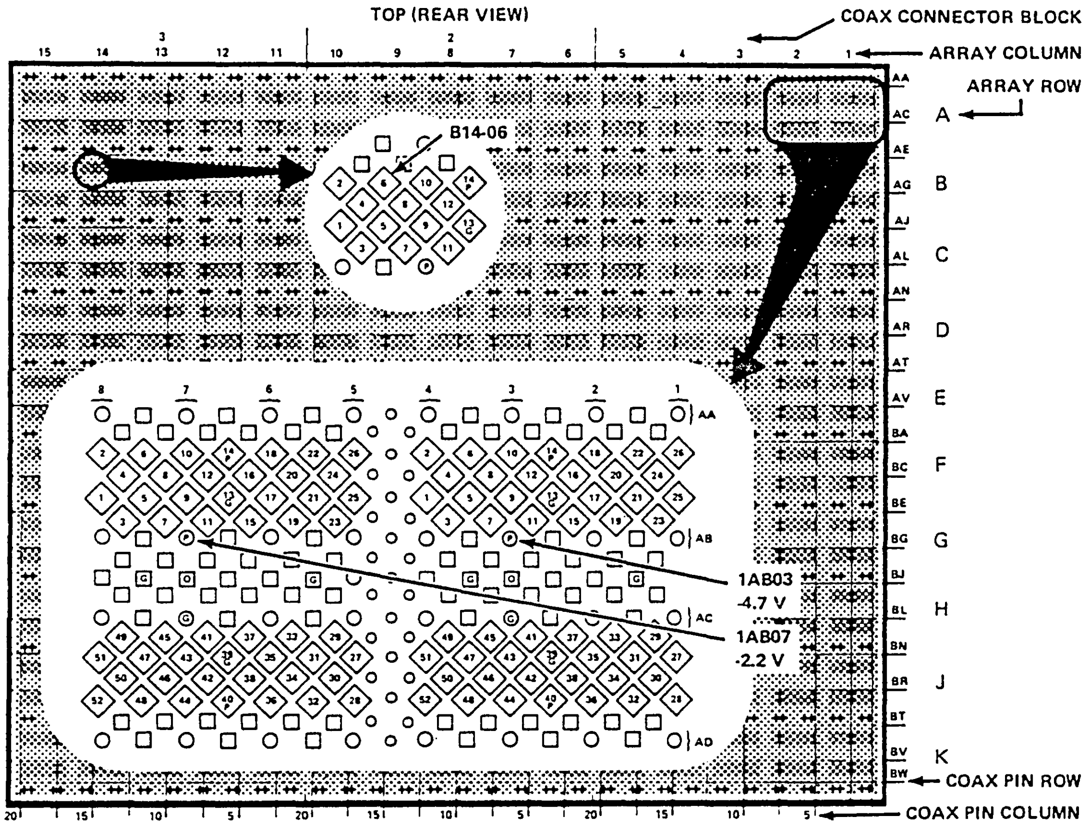
CAUTION

All soldering activity called out in this procedure must be performed by a person with a current soldering certificate rated for LSI board connector pins.

REMOVAL

1. Remove LSI panel assembly and place it on grounded antistatic pad according to Procedure 7CX00008, LSI Panel Removal/Replacement.
2. Put on antistatic wrist strap and connect it to antistatic pad under panel assembly.
3. Remove LSI board stiffener (if one is installed) from panel assembly.
4. Remove water-hose clamp from side of panel assembly by removing two screws and their lock washers. This permits panel assembly to sit flat on work surface.
5. Turn panel assembly so LSI arrays face upward.
6. Remove array(s) from connector with defective header according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.
7. Determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test. Write down test current values and save them for later reference.
8. Remove retainer from connector using one of the following techniques. Be prepared to replace retainer if it is damaged during removal.
    a. Use L-shaped end of mechanic's scribe to pull retainer from connector.
    b. Rock retainer off connector using two pairs of tweezers.
    c. Cut retainer with diagonal cut pliers where retainer passes over cold tube. Then remove severed retainer.
9. Turn panel assembly so its male coax pins face upward.
10. Locate holes in rear of LSI board that contain pin legs of defective header.
11. Identify (using pin designator chart) and record, for later replacement, locations of any insulated pins in defective header. Also record placement of all soldered wires to legs of insulated pins.

12. Unsolder any wire connections from header pin legs. Remove excess solder from legs.



KEY TO PIN SYMBOLS

○ COAX PIN
⊙ -2.2-V OR -4.7-V COAX PIN
◎ GROUND COAX PIN
▣ GROUND
▣ LOGIC ZERO BIAS
◇ GROUND
◇ -4.7 V

COAX PIN DESIGNATOR

1 AB 07

- 07 — COAX PIN COLUMN (1 THROUGH 20)
- AB — COAX PIN ROW (AA THROUGH BW, LETTERS I, O, Q, X, Y AND Z NOT USED)
- 1 — COAX CONNECTOR BLOCK (1 THROUGH 3)

ARRAY PIN DESIGNATOR

B 14 06

- 06 — ARRAY PIN NO. (1 THROUGH 52)
- 14 — ARRAY COLUMN (1 THROUGH 15)
- B — ARRAY ROW (A THROUGH K, LETTER I NOT USED)

NOTE:

THE -4.7-V AND -2.2-V PINS REPEAT EVERY EIGHT HORIZONTAL AND VERTICAL LOCATIONS, FOR EXAMPLE:

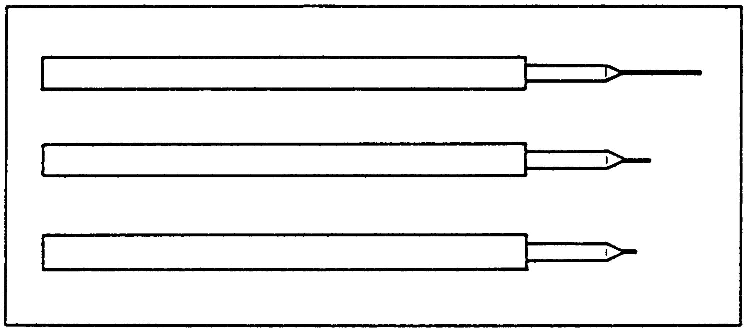
FROM 1AB03, -4.7 V ALSO APPEARS AT 1AB11, 1AB19, 1AK03, AND 1AU03.
FROM 1AB07, -2.2 V ALSO APPEARS AT 1AB15, 1AB23, 1AK07, AND 1AU07.

LSI Board Pin Designators

CAUTION

The ends of the pin removal tools break easily. Use tools only as described.

13. Use a small plastic-head hammer and broken-pin removal tool with short punch to begin tapping header pin legs from rear of LSI board. Use tool with midsize punch, then tool with long punch to tap header pins completely out of board. Header comes off board with pins.



Pin Removal Tools

14. Inspect pin holes in LSI board for debris or insulation. If a hole requires cleaning, insert long punch through hole to remove debris.

15. Leave antistatic wrist strap connected for header replacement.

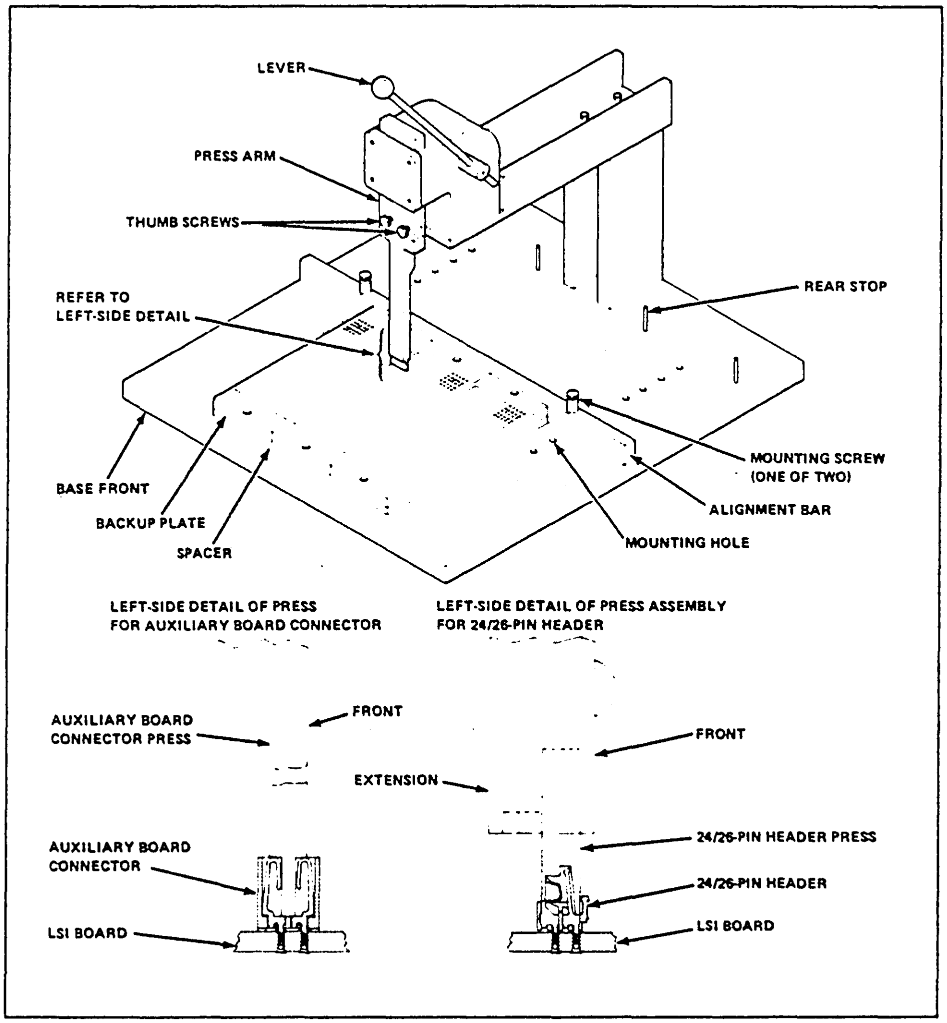
REPLACEMENT

1. Turn LSI panel assembly so its male coax pins face upward.

CAUTION

Shims must be placed on the bottom (pin side) of the LSI board to support the board while pressing in a header. This prevents board flexing that could damage layered circuits and engineering change order (ECO) resistors. The shims are aluminimum strips about 3/32-in thick, 3/16-in wide, and 11/16-in long.

2. Place shims on rear of LSI board between rows of male coax pins as follows:
   a. Use double-backed tape to hold shims on board.
   b. Use longest shims possible.
   c. Place shims directly over pin holes of header being replaced.
   d. Place at least one row of shims over holes directly above and below holes of header being replaced.
   e. Position shims so they do not lay across any resistor, wire, or protruding ECO pin.


LEVER
PRESS ARM
THUMB SCREWS
REFER TO LEFT-SIDE DETAIL
REAR STOP
MOUNTING SCREW (ONE OF TWO)
ALIGNMENT BAR
MOUNTING HOLE
BASE FRONT
BACKUP PLATE
SPACER
LEFT-SIDE DETAIL OF PRESS FOR AUXILIARY BOARD CONNECTOR
LEFT-SIDE DETAIL OF PRESS ASSEMBLY FOR 24/26-PIN HEADER
AUXILIARY BOARD CONNECTOR PRESS
FRONT
FRONT
EXTENSION
24/26-PIN HEADER PRESS
AUXILIARY BOARD CONNECTOR
24/26-PIN HEADER
LSI BOARD
LSI BOARD

Insertion Press

3. Place insertion press backup plate on top of spacer plate.

4. Set panel assembly on top of backup plate. Screw all six jackscrews into backup plate, turning each one a small amount. Alternately screw all six until all are at same degree of tightness.

5. Set press on antistatic pad. Remove extension and alignment bar from press. Set assembly, backup plate, and spacer plate on base of press as follows:

   a. If header to be replaced is in upper position of connector, set top of panel assembly toward front of press base.

   b. If header to be replaced is in lower position of connector, set top of assembly toward rear of press base.

6. Align replacement connector location approximately under press arm.

7. Slide extension (without 24/26-pin header press) into press arm from one side, making sure front of extension faces front of base. Fasten extension in press arm with thumb screws.

8. Install alignment bar on base so panel assembly can be pushed against it and accurately aligned under extension.

9. Remove extension from press arm.

10. Place replacement header on end of 24/26-pin header press. Be careful to orient header so pins will match pin holes in LSI board.

11. Move panel assembly toward front of base to observe header pin holes in LSI board.

12. Place 24/26-pin header press (with header) in extension.

13. Holding extension, lightly seat pins of header in LSI board.

14. Continue holding extension in place while sliding panel assembly back against alignment bar and sideways until top of extension aligns with press arm.

15. Lower lever on press slowly to press header pins completely into LSI board.

16. Release lever and remove extension and 24/26-pin header press from header and press arm.

17. Remove panel assembly from backup plate by loosening jackscrews a small amount and alternately until they are free of backup plate.

18. Remove shims from rear of LSI board.

19. Inspect pins of replacement header from rear of LSI board to see that they are fully seated in board.

20. Inspect both sides of LSI board to see that header sits flat on board and pin legs are in board holes.

21. Redetermine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test.

22. Compare current values recorded in first and second current-limit tests.

    a. If current values are the same, go to step 23.

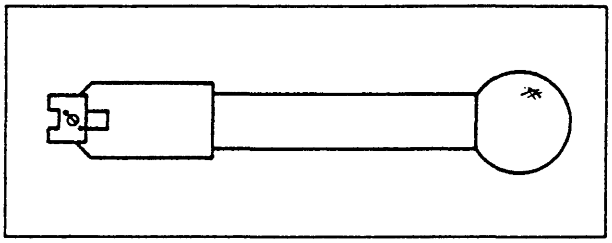
    b. If second test results in higher current values than first test, a short circuit exists. Remove and replace header.

23. Refer to pin information recorded during header removal. Replace standard pins in header with insulated pins, if necessary, according to Procedure 7CX00026, LSI Board 48/52-Pin Connector Pin Removal/Replacement.

NOTE

If one or more pins were replaced, the following steps may be performed as part of the replacement procedure.

24. Resize connector pins by pressing 48/52-pin connector resizing tool over connector assembly.



48/52-Pin Connector Resizing Tool

25. Place retainer onto headers with care to prevent bending connector pins. Retainers for 52-pin connector assemblies must be oriented so side with node is toward right side of panel assembly, as viewed from front of computer. Carefully press retainer to snap it onto headers.

26. Inspect connector pins to ensure none are damaged or pushed down in retainer.

27. Mount water-hose clamp on side of panel assembly with two screws and lock washers.

28. Replace array(s) into connector according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.

29. Replace panel assembly in chassis column according to Procedure 7CX00008, LSI Panel Removal/Replacement.

AUXILIARY BOARD CONNECTOR REMOVAL/REPLACEMENT

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
00213354	Insertion press (including small aluminum shims)
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263495	Antistatic work pad
00217329	Locator board for LSI panel
Local supply	Soldering tools
00205366	Broken pin removal tool kit
Local supply	Plastic-head hammer
Local supply	Double-backed tape

REFERENCES

This procedure references the following procedures.

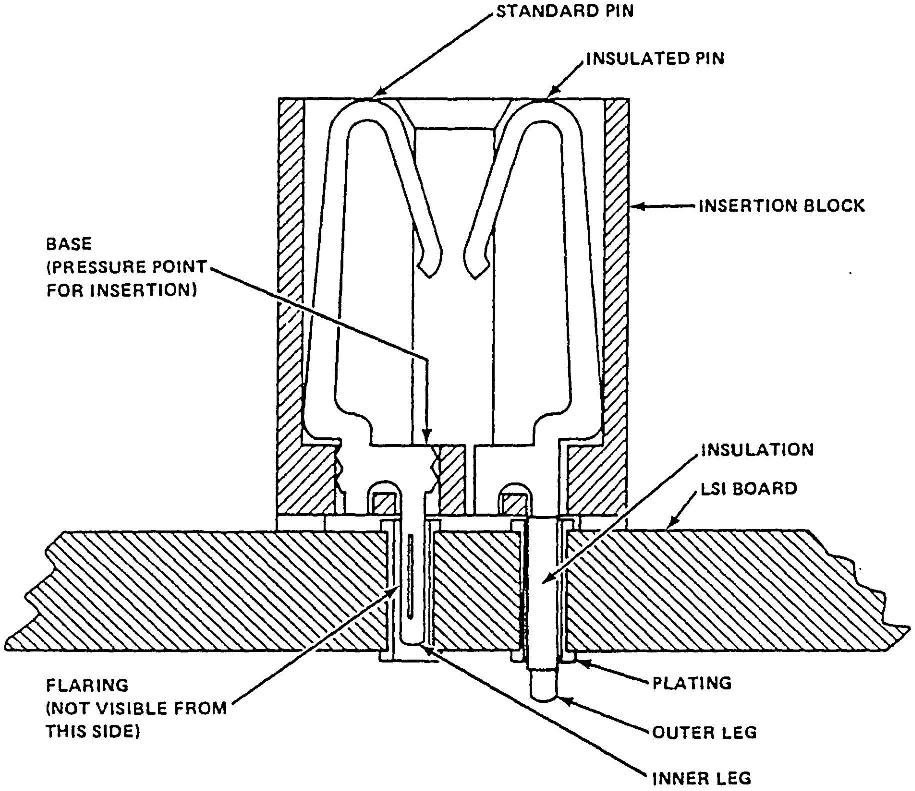
7CX00027	Auxiliary Board Connector Pin Removal/Replacement
7CX00008	LSI Panel Removal/Replacement
7CX00007	Auxiliary Board Removal/Replacement
7CX00015	LSI Panel Current Limit Test

INTRODUCTION

Auxiliary board connectors mount on the front side of the LSI panel assembly. The panel assembly contains a row of 13 connectors for each auxiliary board. Procedure 7CX00027, Auxiliary Board Connector Pin Removal/Replacement, contains a detailed description of the connector and its pins.

NOTE

Connector replacement requires an insertion press. Do not start the removal procedure unless you have a press.



Auxiliary Board Connector

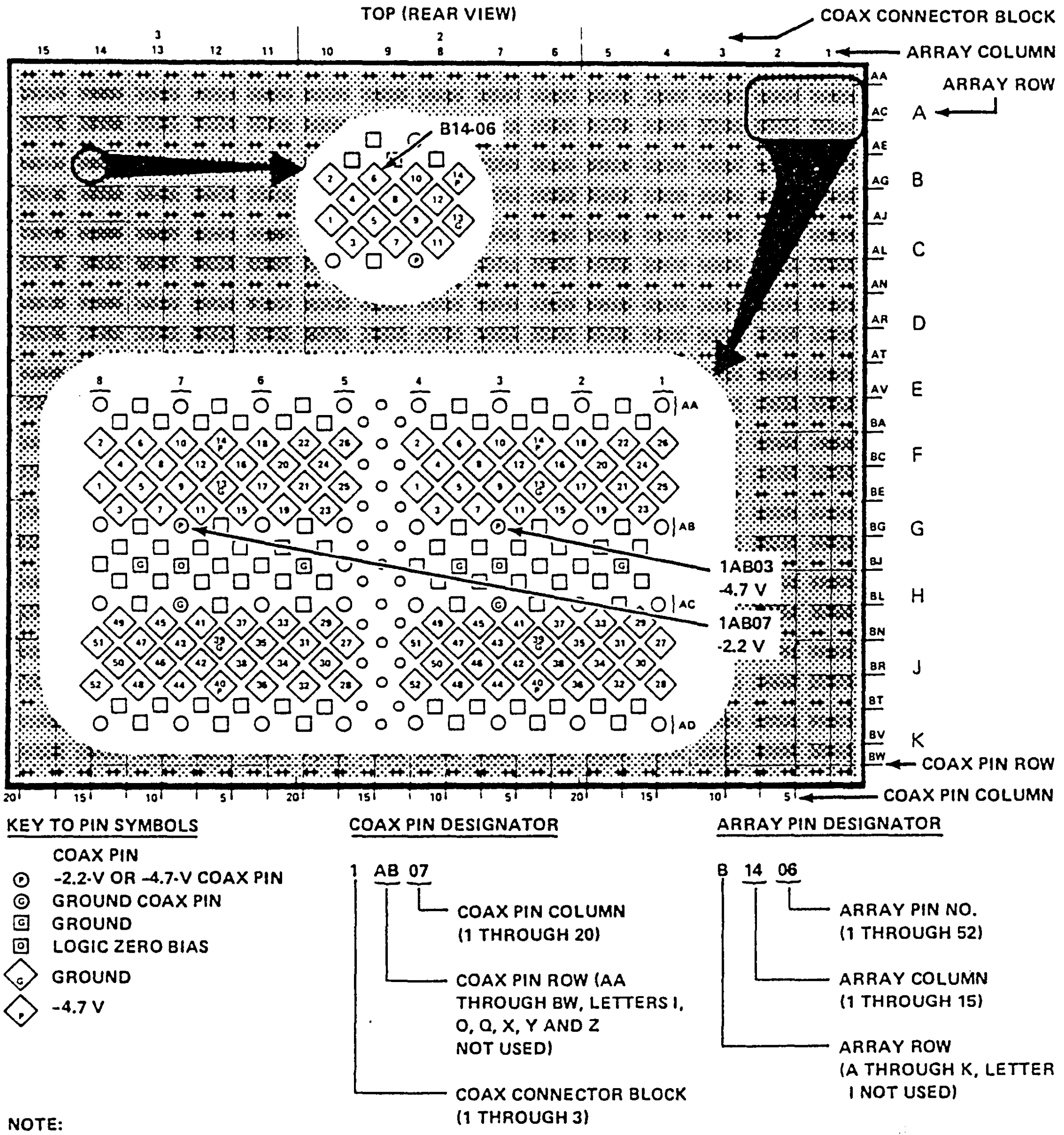
CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

All soldering activity called out in this procedure must be performed by a person with a current soldering certificate rated for LSI board connector pins.

REMOVAL

1. Remove LSI panel assembly and place it on grounded antistatic pad according to Procedure 7CX00008, LSI Panel Removal/Replacement.
2. Put on antistatic wrist strap and connect it to antistatic pad under panel assembly.
3. Remove LSI board stiffener (if one is installed) from panel assembly.
4. Remove water-hose clamp from side of panel assembly by removing two screws and their lock washers. This permits panel assembly to sit flat on work surface.
5. Determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test. Write down test current values and save them for later reference.
6. Remove auxiliary boards (as required) to provide access to defective connector according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.
7. Turn panel assembly so its male coax pins face upward.
8. Place locator board on rear of panel assembly.
9. Locate holes in rear of LSI board that contain pin legs of defective connector.
10. Identify (using pin designator chart) and record, for later replacement, locations of any insulated pins in defective connector. Also record placement of all soldered wires to legs of insulated pins.
11. Unsolder any wire connections from connector pin legs. Remove excess solder from legs.



NOTE:

THE -4.7-V AND -2.2-V PINS REPEAT EVERY EIGHT HORIZONTAL AND VERTICAL LOCATIONS, FOR EXAMPLE:

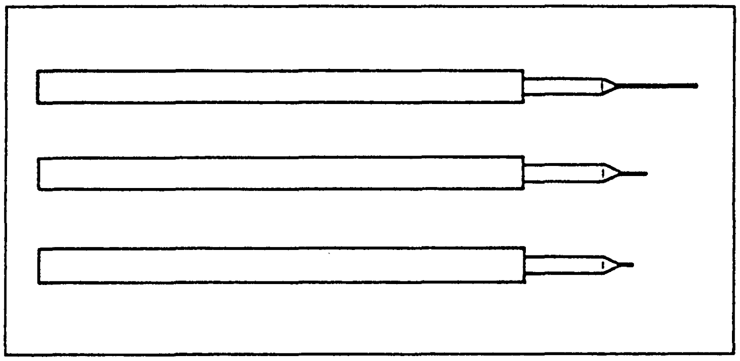
FROM 1AB03, -4.7 V ALSO APPEARS AT 1AB11, 1AB19, 1AK03, AND 1AU03.
FROM 1AB07, -2.2 V ALSO APPEARS AT 1AB15, 1AB23, 1AK07, AND 1AU07.

LSI Board Pin Designators

CAUTION

The ends of the pin removal tools break easily. Use tools only as described.

12. Use a small plastic-head hammer and broken-pin removal tool with short punch to begin tapping connector pin legs from rear of LSI board. Use tool with midsize punch, then tool with long punch to tap connector pins completely out of board.



Pin Removal Tools

13. Inspect pin holes in LSI board for debris or insulation. If a hole requires cleaning, insert long punch through hole to remove debris.
14. Leave antistatic wrist strap connected for header replacement.

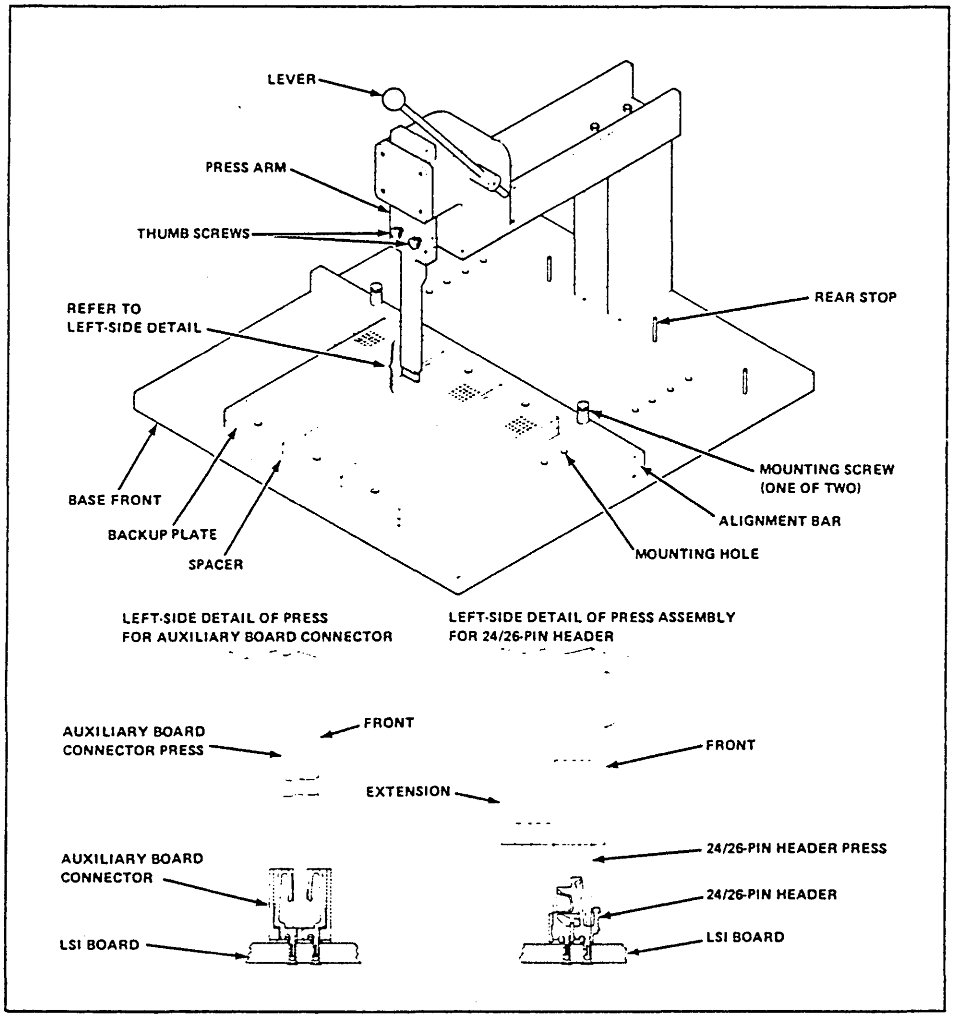
REPLACEMENT

1. Turn LSI panel assembly so its male coax pins face upward.

CAUTION

> Shims must be placed on the bottom (pin side) of the LSI board to support the board while pressing in a connector. This prevents board flexing that could damage layered circuits and engineering change order (ECO) resistors. The shims are aluminimum strips about 3/32-in thick, 3/16-in wide, and 11/16-in long.

2. Place shims on rear of LSI board between rows of male coax pins as follows:
   - a. Use double-backed tape to hold shims on board.
   - b. Use longest shims possible.
   - c. Place shims directly over pin holes of connector being replaced.
   - d. Place at least one row of shims over holes directly above and below holes of connector being replaced.
   - e. Position shims so they do not lay across any resistor, wire, or protruding ECO pin.


LEVER
PRESS ARM
THUMB SCREWS
REFER TO LEFT-SIDE DETAIL
REAR STOP
BASE FRONT
BACKUP PLATE
SPACER
MOUNTING SCREW (ONE OF TWO)
ALIGNMENT BAR
MOUNTING HOLE
LEFT-SIDE DETAIL OF PRESS FOR AUXILIARY BOARD CONNECTOR
LEFT-SIDE DETAIL OF PRESS ASSEMBLY FOR 24/26-PIN HEADER
AUXILIARY BOARD CONNECTOR PRESS
FRONT
EXTENSION
FRONT
24/26-PIN HEADER PRESS
AUXILIARY BOARD CONNECTOR
24/26-PIN HEADER
LSI BOARD
LSI BOARD

Insertion Press

3. Place insertion press backup plate on top of spacer plate.

4. Set panel assembly on top of backup plate. Screw all six jackscrews into backup plate, turning each one a small amount and alternately until all are at same degree of tightness.

5. Set press on antistatic pad. Remove extension and alignment bar from press. Set assembly, backup plate, and spacer plate on base of press as follows:

   a. If connector to be replaced is in upper position of a pair of connectors, set top of panel assembly toward front of press base.

   b. If header to be replaced is in lower position of a pair of connectors, set top of assembly toward rear of press base.

6. Align replacement connector location approximately under press arm.

7. Slide auxiliary board connector press into press arm from one side, making sure front of connector press faces front of base. Fasten connector press to press arm with thumb screws.

8. Install alignment bar on base so panel assembly can be pushed against it and accurately aligned under extension.

9. Remove connector press from press arm.

10. Place replacement connector on end of connector press. Be careful to orient connector so pins will match pin holes in LSI board.

11. Move panel assembly toward front of base to observe connector pin holes in LSI board.

12. Holding connector press, lightly seat pins of connector in LSI board.

13. Continue holding connector press in place while sliding panel assembly back against alignment bar and sideways until top of connector press aligns with press arm.

14. Lower lever on press slowly to press connector pins completely into LSI board.

15. Release lever and remove connector press from connector and press arm.

16. Remove panel assembly from backup plate by loosening jackscrews a small amount and alternately until they are free of backup plate.

17. Remove shims from rear of LSI board.

18. Inspect pins of replacement connector from rear of LSI board to see that they are fully seated in board.

19. Inspect both sides of LSI board to see that connector sits flat on board and pin legs are in board holes.

20. Again determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test.

21. Compare current values recorded in first and second current-limit tests.

    a. If current values are the same, go to step 22.

    b. If second test results in higher current values than first test, a short circuit exists. Remove and replace connector.

22. Refer to pin information recorded during connector removal. Replace standard pins in connector with insulated pins, if necessary, according to Procedure 7CX00027, Auxiliary Board Connector Pin Removal/Replacement.

NOTE

If one or more pins were replaced, the following steps may be performed as part of the replacement procedure.

23. Mount water-hose clamp on side of panel assembly with two screws and lock washers.

24. Replace panel assembly in chassis column according to Procedure 7CX00008, LSI Panel Removal/Replacement.

25. Replace auxiliary boards in panel assembly according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.

LSI BOARD MALE COAX PIN REMOVAL/REPLACEMENT

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263495	Antistatic work pad
Local supply	Long-nose pliers
Local supply	Soldering tools
00205366	Broken pin removal tool kit
Local supply	Plastic-head hammer
00213470	Male coax pin insertion tool (for 0.025-in diameter pin)
00205362	Male coax pin insertion tool (for 0.030-in diameter pin)
Local supply	Tweezers
12263512	Freon TMS solvent
Local supply	Hardman Extra Fast Setting Epoxy (or equivalent)

REFERENCES

This procedure references the following procedures.

7CX00008	LSI Panel Removal/Replacement
7CX00013	LSI Array/Half-Pak Array Removal/Replacement
7CX00015	LSI Panel Current Limit Test

INTRODUCTION

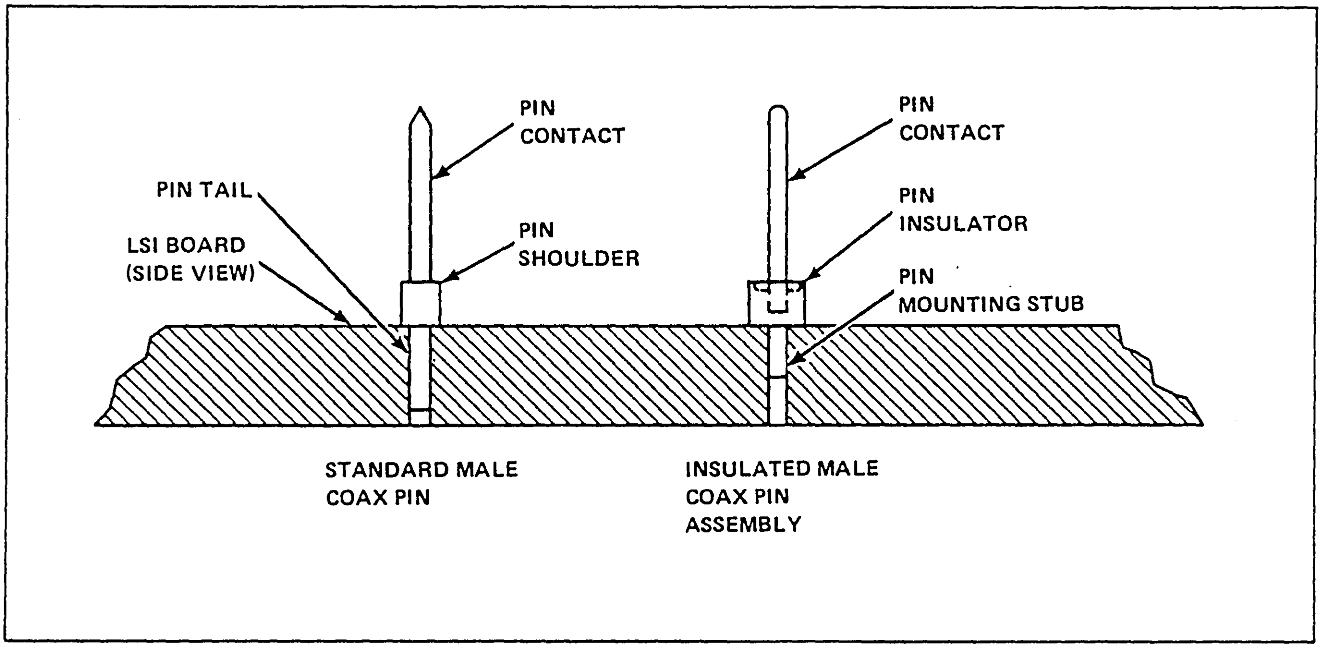
Male coax pins on the rear of LSI boards mate with connectors in the coax blocks and with power and ground pins in the power bus board. Replacement of a male coax pin becomes necessary when a damaged pin is beyond repair or when it is part of a board modification. In either case, the replacement pin must be a new one.

There are two kinds of male coax pins, standard and insulated. The standard pin is solid metal, while the insulated pin consists of a pin contact and a pin insulator. You typically replace a standard pin with an insulated pin when modifying an LSI board.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

All soldering activity called out in this procedure must be performed by a person with a current soldering certificate rated for LSI board connector pins.



Male Coax Pins

This procedure contains six sections. The first and last sections cover tasks you perform before and after replacing either kind of pin. The other four sections describe how to remove and replace either kind of pin.

BEFORE REMOVING A PIN

1. Remove LSI panel assembly and place it on grounded antistatic pad according to Procedure 7CX00008, LSI Panel Removal/Replacement.
2. Put on antistatic wrist strap and connect it to antistatic pad under panel assembly.
3. Remove LSI board stiffener (if one is installed) from panel assembly.
4. Remove water-hose clamp from side of panel assembly by removing two screws and their lock washers. This permits panel assembly to sit flat on work surface.
5. Locate pin to be replaced. Remove array(s) from adjacent connector according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.
6. Turn panel assembly so male coax pins face upward.
7. Determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test. Write down test current values and save them for later reference.

8. Observe pin to be replaced and determine whether it is a standard or insulated pin.

9. Go to applicable removal procedure for standard pin or insulated pin.

STANDARD PIN REMOVAL

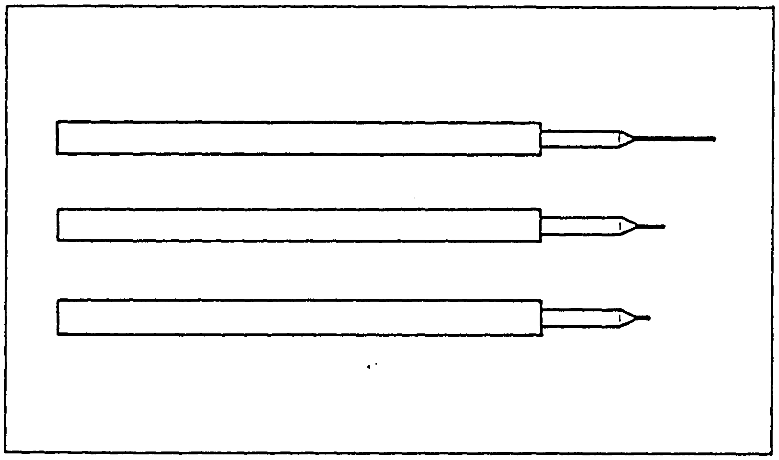
1. Record orientation of rectangular cross section of pin tail to sides of LSI board when removing pin from board. This is important because you must install new pin rotated 90 degrees from recorded orientation.

CAUTION

> Use extreme care when removing pin. A pin can easily break off below its shoulder when not properly removed. Depending on the location of the pin, such breakage may not be field-repairable.

2. Grasp pin shoulder with long-nose pliers and pull pin straight up and out of LSI board without twisting. If pin is broken off flush with board:
   a. Turn panel assembly so array side faces upward.
   b. Determine location of broken pin from array side of LSI board.
   c. Use broken-pin removal tools in order of shortest to longest and a plastic-head hammer to tap out pin. If pin location is under a cold tube, pin cannot be tapped out and is not field-repairable.

3. Leave antistatic wrist strap connected for replacement.



Pin Removal Tools

INSULATED PIN REMOVAL

1. Unsolder any backpanel wire connected to pin.

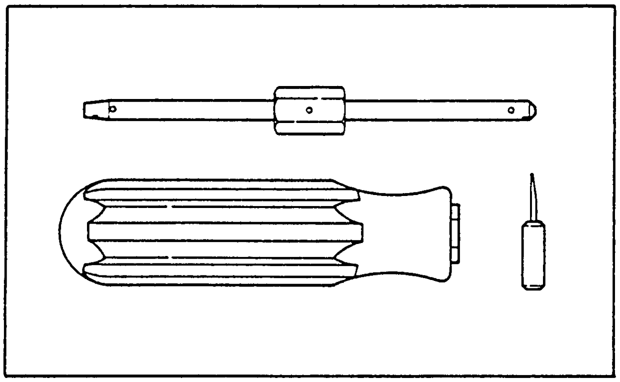
NOTE

The pin contact and the pin insulator fasten together and to the LSI board with an adhesive that loosens when heated.

2. Remove pin as follows:
   a. If pin is not broken, heat insulator part of pin with soldering iron and remove pin assembly from LSI board with long-nose pliers.
   b. If pin is broken off flush with board, turn panel assembly so array side faces upward. Use broken-pin removal tools in order of shortest to longest and a plastic-head hammer to tap out pin stub. If stub is under a cold tube, it cannot be tapped out and is not field-repairable.
3. Leave antistatic wrist strap connected for replacement.

STANDARD PIN REPLACEMENT

1. Place long end of standard pin into end of coax pin insertion tool.



Male Coax Pin Insertion Tool

2. Use insertion tool to set short end of coax pin lightly into hole in LSI board with rectangular cross section of pin tail rotated 90 degrees from orientation recorded during removal. Press pin straight into board.
3. Replace removed array(s) according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.
4. After completing panel assembly maintenance, perform steps listed under After Replacing Pin.

INSULATED PIN REPLACEMENT

1. Clean old adhesive from hole in LSI board using tweezers and Freon.
2. Mix a few drops of epoxy on piece of paper.
3. Hold pin insulator with long-nose pliers and dip mounting stub in epoxy.
4. Use tweezers to dip tip of pin in adhesive and to place tip of pin into insulator. Keep adhesive off exposed portion of pin.
5. Push assembled pin into hole in LSI board.
6. Allow epoxy to harden.

7. Connect backpanel wire to pin as follows:

CAUTION

The backpanel wire connection to the pin must be neat and close to the pin insulator to prevent crushing the wire or its connection during installation of the panel assembly.

   a. Place one turn of backpanel wire around connector pin. Wire must not overlap itself.

   b. Solder wire at base of connector pin, next to insulator. Excessive soldering heat may loosen pin adhesive. Adhesive will harden as it cools.

8. Replace removed array(s) according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.

9. After completing panel assembly maintenance, perform steps listed under: After Replacing Pin.

AFTER REPLACING PIN

1. Again determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test.

2. Compare current values recorded in first and second current-limit tests.

   a. If current values are the same, go to step 3.

   b. If second test results in higher current values than first test, a short circuit exists. Remove and replace pin.

3. Mount water-hose clamp on side of assembly with two screws and lock washers.

4. Replace panel assembly in chassis column according to Procedure 7CX00008, LSI Panel Removal/Replacement.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263495	Antistatic work pad
Local supply	Miscellaneous hand tools (for retainer removal)
Local supply	Small long-nose pliers
Local supply	Soldering tools
00205366	Broken pin removal tool kit
Local supply	Plastic-head hammer
Local supply	Fine-pointed tweezers (two pair)
Local supply	Single-edge razor blade
Local supply	Diagonal cutter
12263483	Microscope
12263484	Stand
12263485	Arm
12263487	Eyepiece (10x)
12263639	Light
12263640	Power pack for light
00217805	48/52-pin connector pin seating tool (for C-shaped pin)
00217806	48/52-pin connector pin seating tool (for L-shaped pin)

REFERENCES

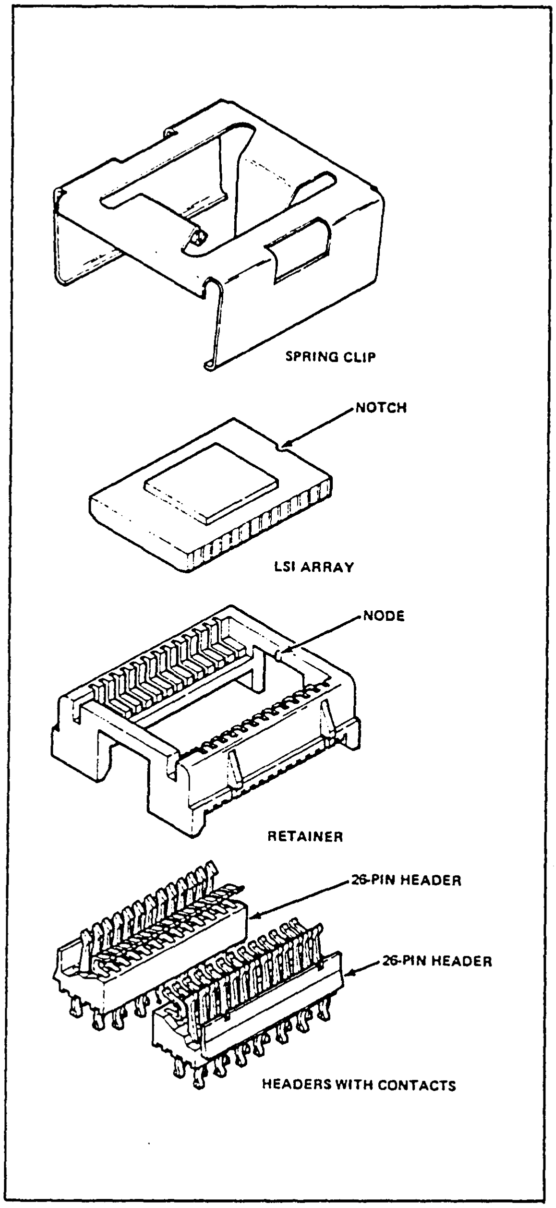
This procedure references the following procedures.

7CX00008	LSI Panel Removal/Replacement
7CX00013	LSI Array/Half-Pak Array Removal/Replacement
7CX00015	LSI Panel Current Limit Test

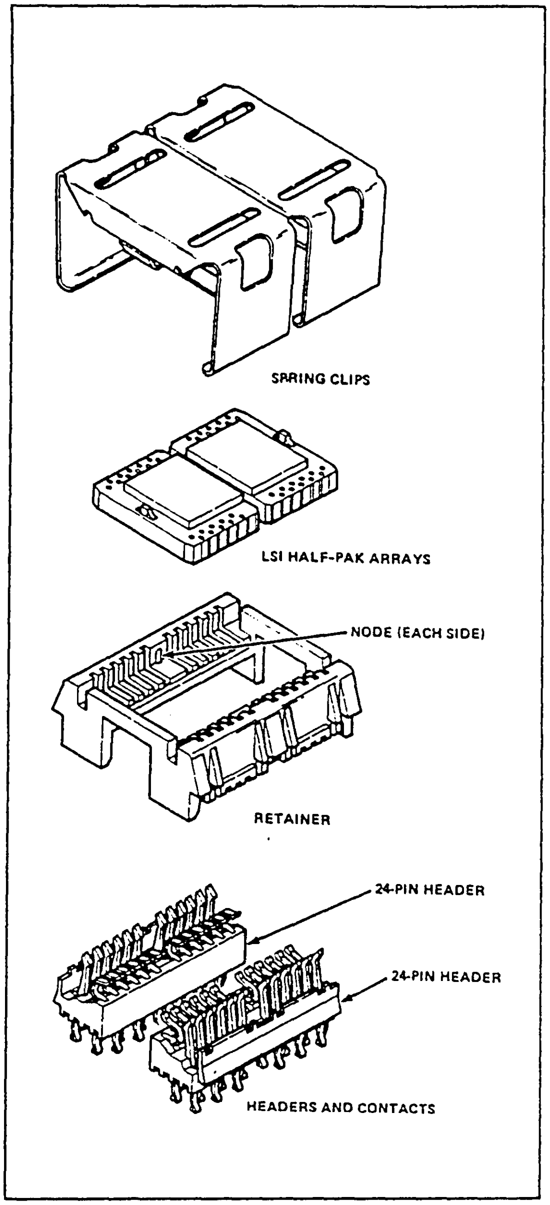
INTRODUCTION

Each 52-pin connector assembly connects one LSI array to the LSI board and holds the array against a cold tube with a spring clip. The 48-pin connector assembly is similar, except it mounts two half-pak arrays and uses two spring clips.

Each connector assembly includes two headers, each with two rows of pins. A plastic retainer holds the pins in place.

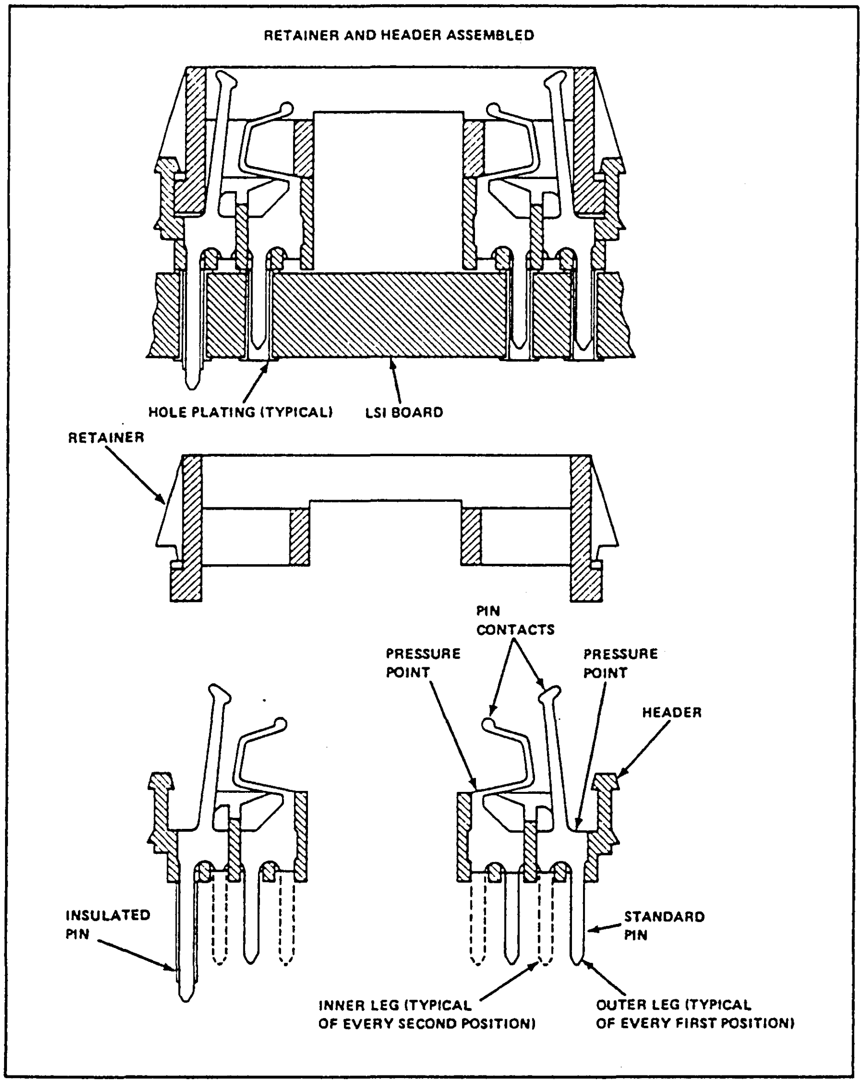


52-Pin Connector Assembly



48-Pin Connector Assembly

Each connector pin has three attributes: it may be bottom contact or side contact, inner leg or outer leg, and standard or insulated. Bottom contact and side contact refer to the header row the pin may occupy (bottom contact pins are in the inside row). Inner leg and outer leg refer to pin leg offset that allows pins to be staggered on the plated-hole grid of the LSI board. Standard and insulated refer to whether the pin makes contact with a plated hole (standard) or whether the pin protrudes through the board so a wire can be soldered to it (insulated). The various combinations of these attributes result in eight distinct types of pins.


RETAINER AND HEADER ASSEMBLED
HOLE PLATING (TYPICAL)
LSI BOARD
RETAINER
PIN CONTACTS
PRESSURE POINT
PRESSURE POINT
HEADER
INSULATED PIN
STANDARD PIN
INNER LEG (TYPICAL OF EVERY SECOND POSITION)
OUTER LEG (TYPICAL OF EVERY FIRST POSITION)

Connector Pins, Headers, and Retainer

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

All soldering activity called out in this procedure must be performed by a person with a current soldering certificate rated for LSI board connector pins.

REMOVAL

1. Remove LSI panel assembly and place it on grounded antistatic pad according to Procedure 7CX00008, LSI Panel Removal/Replacement.

2. Put on antistatic wrist strap and connect it to antistatic pad under panel assembly.

3. Remove LSI board stiffener (if one is installed) from panel assembly.

4. Remove water-hose clamp from side of panel assembly by removing two screws and their lock washers. This permits panel assembly to sit flat on work surface.

5. Turn panel assembly so arrays face upward.

6. Remove array(s) from connector to be repaired or modified according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.

7. Determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test. Write down test current values and save them for later reference.

8. Remove retainer from connector using one of the following techniques. Be prepared to replace retainer if it is damaged during removal.

   a. Use L-shaped end of mechanic's scribe to pull retainer from connector.

   b. Rock retainer off connector using two pairs of tweezers.

   c. Cut retainer with diagonal cut pliers where retainer passes over cold tube. Then remove severed retainer.

9. Turn panel assembly so its male coax pins face upward.

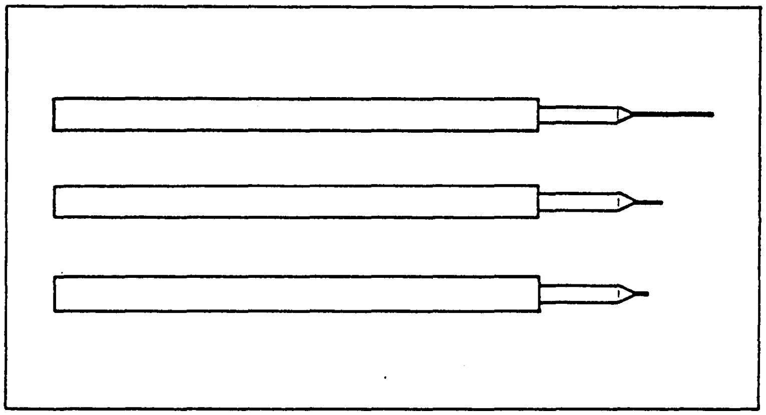
10. Locate (using pin designator chart) hole in rear of LSI board that contains leg of defective pin.

11. If pin has soldered connection, unsolder it. Remove excess solder from leg.

CAUTION

The ends of the pin removal tools break easily. Use tools only as described.

12. Use a small plastic-head hammer and broken-pin removal tool with short punch to begin tapping pin leg from rear of LSI board. Use tool with midsize punch, then tool with long punch to tap pin completely out of board.

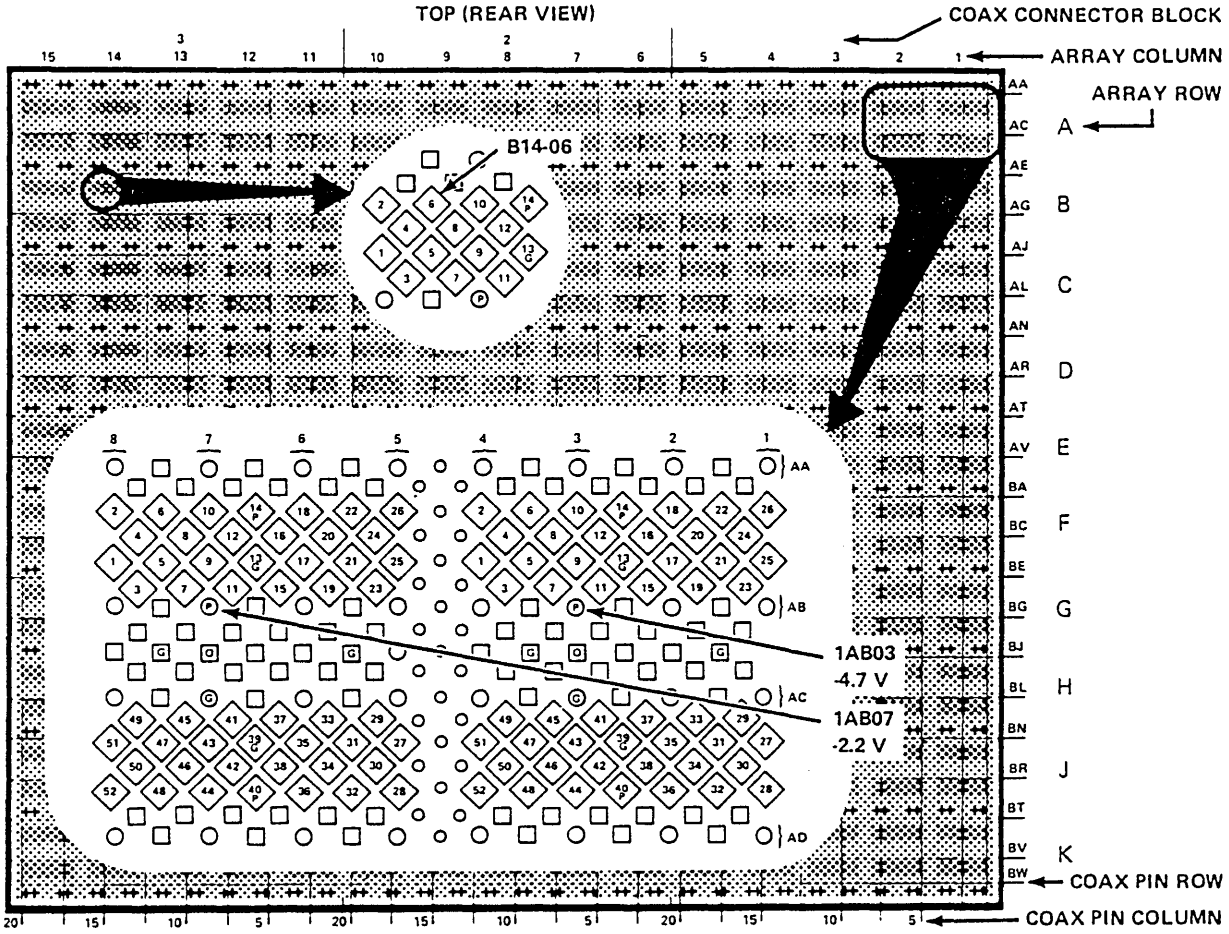


Pin Removal Tools

13. Identify pin attributes (bottom contact or side contact, inner leg or outer leg, standard or insulated) for later replacement.

14. Inspect pin hole in LSI board for debris or insulation. If hole requires cleaning, insert long punch through hole to remove debris.

15. Leave antistatic wrist strap connected for pin replacement.



KEY TO PIN SYMBOLS

COAX PIN
ⓟ -2.2-V OR -4.7-V COAX PIN
ⓖ GROUND COAX PIN
▣ GROUND
▢ LOGIC ZERO BIAS
◇ GROUND
◇ -4.7 V

COAX PIN DESIGNATOR

1 AB 07
- 07 — COAX PIN COLUMN (1 THROUGH 20)
- AB — COAX PIN ROW (AA THROUGH BW, LETTERS I, O, Q, X, Y AND Z NOT USED)
- 1 — COAX CONNECTOR BLOCK (1 THROUGH 3)

ARRAY PIN DESIGNATOR

B 14 06
- 06 — ARRAY PIN NO. (1 THROUGH 52)
- 14 — ARRAY COLUMN (1 THROUGH 15)
- B — ARRAY ROW (A THROUGH K, LETTER I NOT USED)

NOTE:

THE -4.7-V AND -2.2-V PINS REPEAT EVERY EIGHT HORIZONTAL AND VERTICAL LOCATIONS, FOR EXAMPLE:

FROM 1AB03, -4.7 V ALSO APPEARS AT 1AB11, 1AB19, 1AK03, AND 1AU03.
FROM 1AB07, -2.2 V ALSO APPEARS AT 1AB15, 1AB23, 1AK07, AND 1AU07.

LSI Board Pin Designators

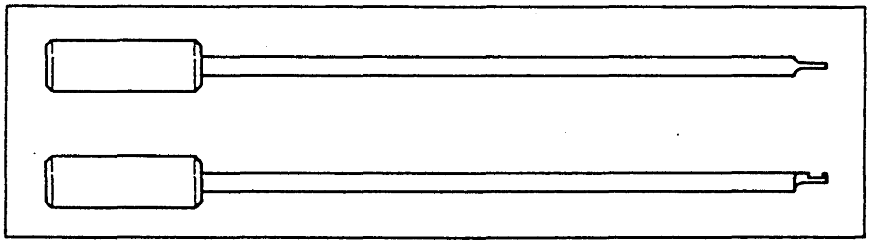
REPLACEMENT

1. Determine type of pin to be replaced. If standard pin, go to step 2. If insulated pin, cut pin insulation to about 1.5 mm (1/16 in) below end of pin, using sharp razor blade to make a 45-degree cut.

2. Turn LSI panel assembly so LSI arrays face upward.

3. Use fine-pointed tweezers or small long-nose pliers to place pin in connector header.

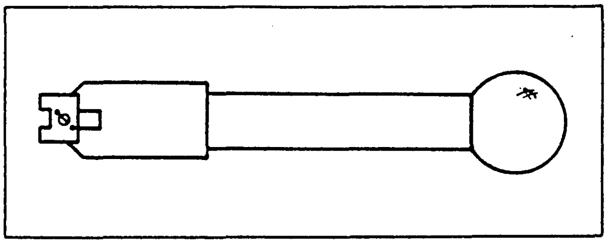
4. Press pin into place with appropriate pin seating tool, using pressure points shown in Connector Pins, Headers, and Retainer figure.



48/52-Pin Connector Pin Seating Tools

5. Inspect pin hole at rear of board to see that pin is fully seated.

6. Resize connector pins by pressing 48/52-pin connector resizing tool over connector assembly.



48/52-Pin Connector Resizing Tool

7. Place retainer onto headers with care to prevent bending connector pins. Retainers for 52-pin connector assemblies must be oriented so side with node is toward right side of assembly, as viewed from front of computer. Carefully press retainer to snap it onto headers.

8. Complete any LSI board modification required by installation of an insulated pin.

   a. Turn panel assembly so its male coax pins face upward.

   CAUTION

   Be careful to retain and remove cut-off portion of pin to prevent it from being dropped within the panel assembly.

   b. Cut protruding end of pin at rear of board with diagonal cutter so end is just below level of male coax pin shoulders.

   c. Use microscope and two sets of fine-pointed tweezers to loosen and roll back insulation from end of pin to permit soldered connection to pin.

   d. Solder board modification wire to replacement pin, as required.

   e. Turn panel assembly so LSI arrays face upward.

9. Again determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test.

10. Replace removed array(s) according to Procedure 7CX00013, LSI Array/Half-Pak Array Removal/Replacement.

11. Compare current values recorded in first and second current-limit tests.

    a. If current values are the same, go to step 12.

    b. If second test results in higher current values than first test, a short circuit exists. Remove and replace pin.

12. Mount water-hose clamp on side of assembly with two screws and lock washers.

13. Replace panel assembly in chassis column according to Procedure 7CX00008, LSI Panel Removal/Replacement.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263495	Antistatic work pad
Local supply	Small long-nose pliers
Local supply	Soldering tools
00205366	Broken pin removal tool kit
Local supply	Plastic-head hammer
Local supply	Fine-pointed tweezers (two pair)
Local supply	Single-edge razor blade
Local supply	Diagonal cutter
00217698	Auxiliary board pin seating tool
12263483	Microscope
12263484	Stand
12263485	Arm
12263487	Eyepiece (10x)
12263639	Light
12263640	Power pack for light

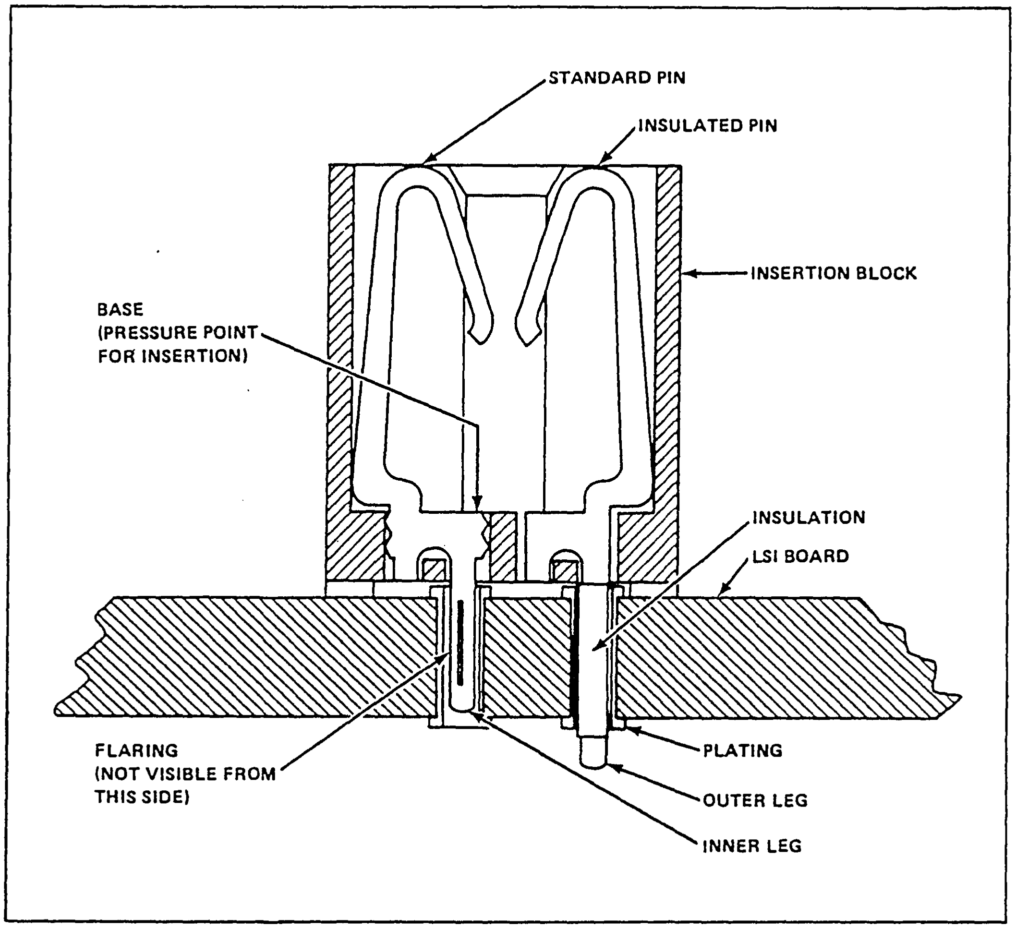
REFERENCES

This procedure references the following procedures.

7CX00007	Auxiliary Board Removal/Replacement
7CX00008	LSI Panel Removal/Replacement
7CX00015	LSI Panel Current Limit Test

INTRODUCTION

Auxiliary board connectors mount on the LSI board to connect the edgeboard pins of the auxiliary board with LSI board circuits. Each connector has an insertion block with two rows of 13 press-fit pins. Each pin has an inner or outer leg to permit staggered leg positions within the insertion block. The pin extends through the block and into a plated hole in the LSI panel.



Auxiliary Board Connector

Each connector pin has two attributes: it may be inner leg or outer leg, and standard or insulated. Inner leg and outer leg refer to pin leg offset that allows pins to be staggered on the plated-hole grid of the LSI board. Standard and insulated refer to whether the pin makes contact with a plated hole (standard) or whether the pin protrudes through the board so a wire can be soldered to it (insulated). The various combinations of these attributes result in four distinct types of pins.

CAUTION

To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

All soldering activity called out in this procedure must be performed by a person with a current soldering certificate rated for LSI board connector pins.

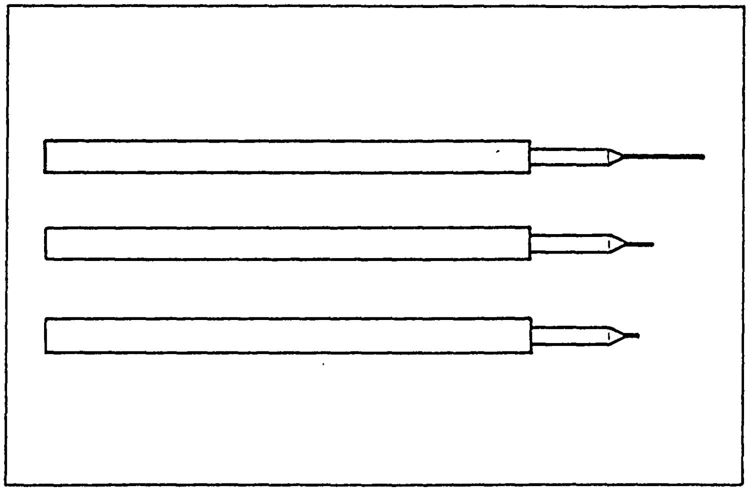
REMOVAL

1. Remove auxiliary boards (as required) to provide access to defective connector according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.
2. Remove LSI panel assembly and place it on grounded antistatic pad according to Procedure 7CX00008, LSI Panel Removal/Replacement.
3. Put on antistatic wrist strap and connect it to antistatic pad under panel assembly.
4. Remove LSI board stiffener (if one is installed) from panel assembly.
5. Remove water-hose clamp from side of panel assembly by removing two screws and their lock washers. This permits panel assembly to sit flat on work surface.
6. Determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test. Write down test current values and save them for later reference.
7. Turn panel assembly so its male coax pins face upward.
8. Locate hole in rear of LSI board that contains leg of defective pin.
9. If pin has soldered connection, unsolder it. Remove excess solder from leg.

CAUTION

The ends of the pin removal tools break easily. Use tools only as described.

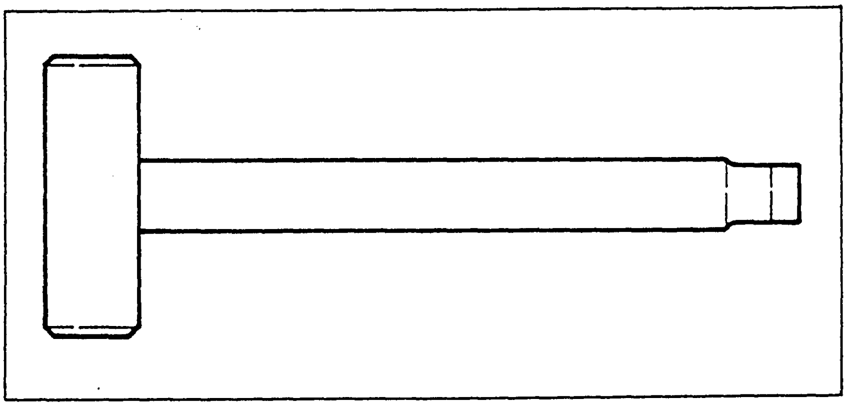
10. Use a small plastic-head hammer and broken-pin removal tool with short punch to begin tapping pin leg from rear of LSI board. Use tool with midsize punch, then tool with long punch to tap pin completely out of board.
11. Identify pin attributes (inner leg or outer leg, standard or insulated) for later replacement.
12. Inspect pin hole in LSI board for debris or insulation. If hole requires cleaning, insert long punch through hole to remove debris.
13. Leave antistatic wrist strap connected for pin replacement.



Pin Removal Tools

REPLACEMENT

1. Determine type of pin to be replaced. If standard pin, go to step 2. If insulated pin, cut pin insulation to about 1.5 mm (1/16 in) below end of pin, using sharp razor blade to make a 45-degree cut.
2. Turn LSI panel assembly so LSI arrays face upward.
3. Use fine-pointed tweezers or small long-nose pliers to place pin in insertion block. Use forceps if cold plates prevent tweezers from reaching insertion block.
4. Press pin into place with auxiliary board pin seating tool.



Auxiliary Board Pin Seating Tool

5. Test connector pin by inserting and removing auxiliary board according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.

6. Inspect pin for damage. Replace pin again if necessary.

7. Complete any LSI board modification required by installation of an insulated pin.

   a. Turn panel assembly so its male coax pins face upward.

      CAUTION

      Be careful to retain and remove cut-off portion of pin to prevent it from being dropped within the panel assembly.

   b. Cut protruding end of pin at rear of board with diagonal cutter so end is just below level of male coax pin shoulders.

   c. Use microscope and two sets of fine-pointed tweezers to loosen and roll back insulation from end of pin to permit soldered connection to pin.

   d. Solder board modification wire to replacement pin, as required.

   e. Turn panel assembly so LSI arrays face upward.

8. Again determine maximum test currents for panel assembly according to Procedure 7CX00015, LSI Panel Current Limit Test.

9. Compare current values recorded in first and second current-limit tests.

   a. If current values are the same, go to step 10.

   b. If second test results in higher current values than first test, a short circuit exists. Remove and replace pin.

10. Mount water-hose clamp on side of assembly with two screws and lock washers.

11. Replace panel assembly in chassis column according to Procedure 7CX00008, LSI Panel Removal/Replacement.

12. Replace auxiliary board according to Procedure 7CX00007, Auxiliary Board Removal/Replacement.

ZIF COLD PLATE ASSEMBLY (B) REMOVAL/REPLACEMENT

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local supply	7/8-in open-end wrench
Local supply	7/16-in open-end wrench
Local supply	3/4-in open-end wrench

REFERENCES

This procedure references the following procedures:

7CX00009	Chassis Column Power Removal/Application (Power Manual)
7CX00033	ZIF Temperature Protect Board (B) Removal/Replacement
7CX00036	ZIF Board Removal/Replacement
7CX00035	Chassis Column Water Draining/Filling
7CX00010	Chassis Column Current Limit Test

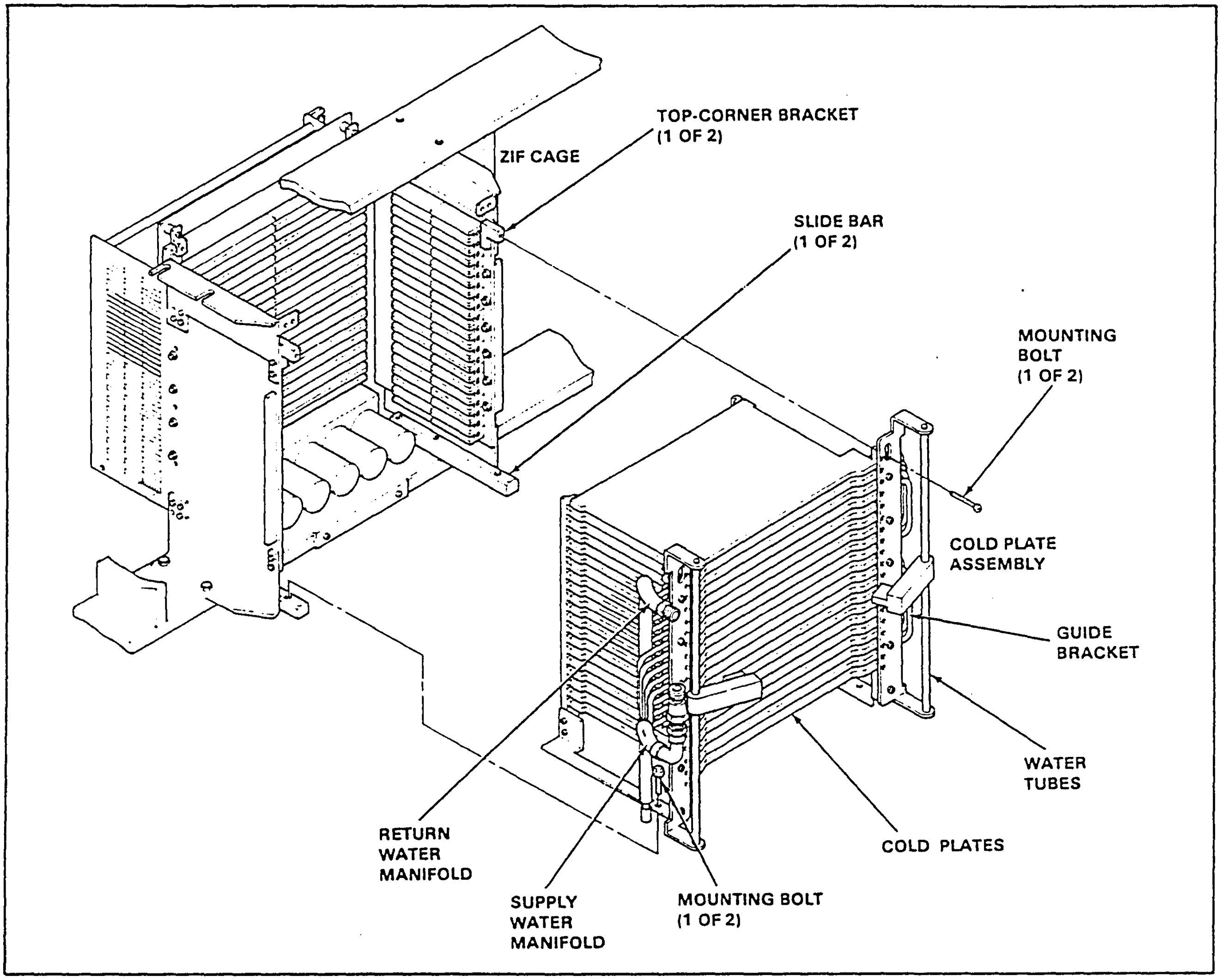
INTRODUCTION

Each ZIF cage contains a removable cold plate assembly, which consists of 20 cold plates and interconnecting water tubes.

The cold plates absorb heat from the ZIF boards mounted in the ZIF cage. Each ZIF board contacts 1 of the 20 cold plates.

The water tubes circulate cooling water through the cold plates. The tubes connect to a supply water manifold on the right side of the cold plate assembly and to a return water manifold on the left side of the cold plate assembly. Removable hoses connect the water manifolds to the supply and return water lines on the left side of the chassis column. Removable hoses connect the water lines to a water cooling unit.

This procedure applies to a cold plate assembly with the supply and return manifolds on opposite sides of the assembly. Procedure 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement, applies to a cold plate assembly with the supply and return manifolds on the left side of the assembly.



ZIF Cage and Cold Plate Assembly

REMOVAL

1. Drain water from chassis column according to Procedure 7CX00035, Chassis Column Water Draining/Filling.
2. Remove temperature protect board according to Procedure 7CX00033, ZIF Temperature Protect Board (B) Removal/Replacement.
3. Remove all ZIF boards from ZIF cage according to Procedure 7CX00036, ZIF Board Removal/Replacement.
4. Close all ZIF connectors by turning right ZIF keys 90° counterclockwise and left ZIF keys 90° clockwise.

5. Remove all ZIF keys from ZIF cage.
6. Remove plastic cover from supply water hose below ZIF cage.

CAUTION

To avoid water damage to electronic components, place sheets of paper over power distribution (PD) box and ZIF cages below cold plate assembly being removed.

7. Disconnect water hose from supply water line on left side of chassis column. Turn hose fitting with 7/8-in open-end wrench while holding left elbow of supply water line with 7/16-in open-end wrench.
8. Disconnect water hose from return water line on left side of chassis column. Turn hose fitting with 7/8-in open-end wrench while holding water line fitting with 3/4-in open-end wrench.
9. Remove screw, lockwasher, and spacer from upper corners of cold plate assembly, and remove screw and lockwasher from lower corners of cold plate assembly.

CAUTION

Use care in removing cold plate assembly from ZIF cage. Assembly weighs about 17 kg (37 lb).

10. Remove cold plate assembly from ZIF cage by grasping it firmly by guide brackets, sliding it forward to get one hand under it, and lifting it from ZIF cage.

REPLACEMENT

Replacement consists of reversing removal procedure. In addition, test chassis column for short circuits according to Procedure 7CX00010, Chassis Column Current Limit Test, after you replace ZIF boards and temperature protect board.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
53705665	Backpanel repair tool kit
Local supply	Long-nose pliers
Local supply	Sheet of paper
Local supply	Phillips screwdriver
Local supply	Plastic-head hammer
53812060	Backpanel repair parts kit

REFERENCES

This procedure references the following procedures:

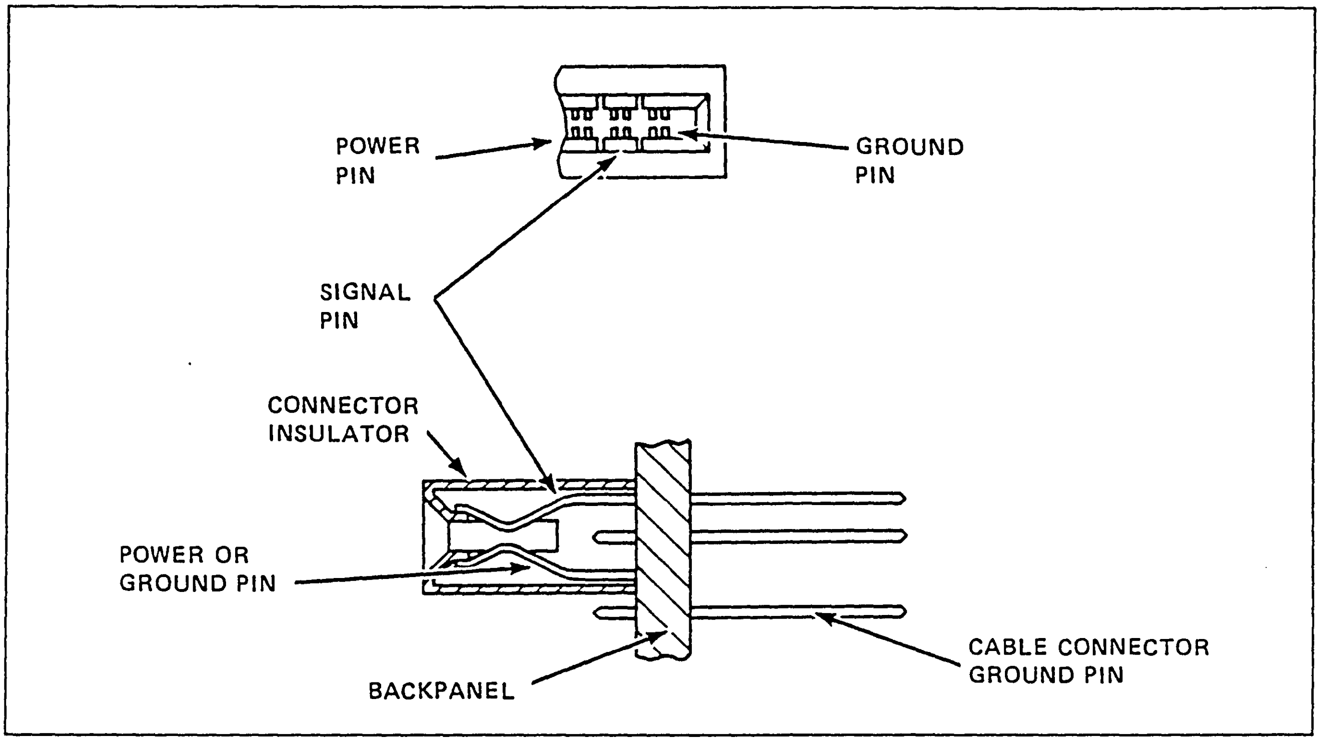
7CX00009	Chassis Column Power Removal/Application (Power Manual)
7CX00030	ZIF Cold Plate Assembly (B) Removal/Replacement
7CX00038	ZIF Cold Plate Assembly (A) Removal/Replacement
7CX00018	Equipment Switch Board Removal/Replacement

INTRODUCTION

The ZIF backpanel provides connections between the rear connector pads of the 20 ZIF boards in a ZIF cage and coax cables to other logic assemblies. The backpanel pins, which consist of edgeboard connector pins and cable connector ground pins, are in four rows for each ZIF board location. A backpanel mounts on the back of each ZIF cage.

The edgeboard connector pins for each ZIF board are in two rows of 94 pins. Each pin is one of three types: signal, power, or ground. The signal pins extend through the backpanel to provide connections to the center conductor of the coax cables. The power and ground pins do not extend through the backpanel to prevent shorting to the cable connector pins. Two insulators fit tightly end-to-end over the edgeboard connector pins. Each insulator is removable for access to the pins.

The cable connector ground pins are in two rows of 46 pins, with a cable connector ground pin below each edgeboard connector signal pin. The cable connector ground pins extend through the backpanel to provide connections to the shield of the coax cables.



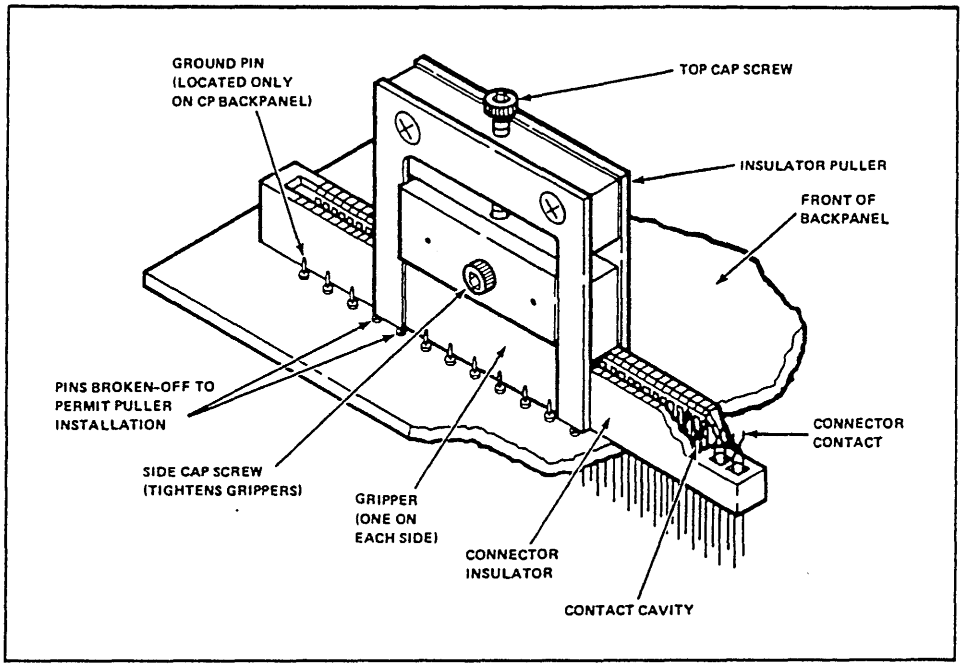
ZIF Backpanel Pins

REMOVAL

1. Remove power from chassis column containing ZIF cages according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Remove cold plate assembly from ZIF cage according to Procedure 7CX00030, ZIF Cold Plate Assembly (B) Removal/Replacement, or 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement.

3. Lower grippers of insulator puller by turning top cap screw with Allen drive tool. Insulator puller and Allen drive tool are part of backpanel repair tool kit.


GROUND PIN (LOCATED ONLY ON CP BACKPANEL)
TOP CAP SCREW
INSULATOR PULLER
FRONT OF BACKPANEL
PINS BROKEN-OFF TO PERMIT PULLER INSTALLATION
CONNECTOR CONTACT
SIDE CAP SCREW (TIGHTENS GRIPPERS)
GRIPPER (ONE ON EACH SIDE)
CONNECTOR INSULATOR
CONTACT CAVITY

Connector Insulator Removal

4. Place insulator puller over connector insulator. If cable connector ground pins interfere with puller installation, break off pins at base with long-nose pliers.

5. Tighten grippers on insulator by turning side cap screw with Allen drive tool.

6. Remove insulator from backpanel by turning top cap screw.

7. Remove insulator from puller by turning side cap screw.

NOTE

An equipment switch board may be installed on the back of ZIF cage A. If a backpanel pin is being removed from ZIF cage A, remove the board (if present) according to Procedure 7CX00018, Equipment Switch Board Removal/Replacement. Do not remove extension plates from board.

Label cable connection to backpanel pin for later replacement.

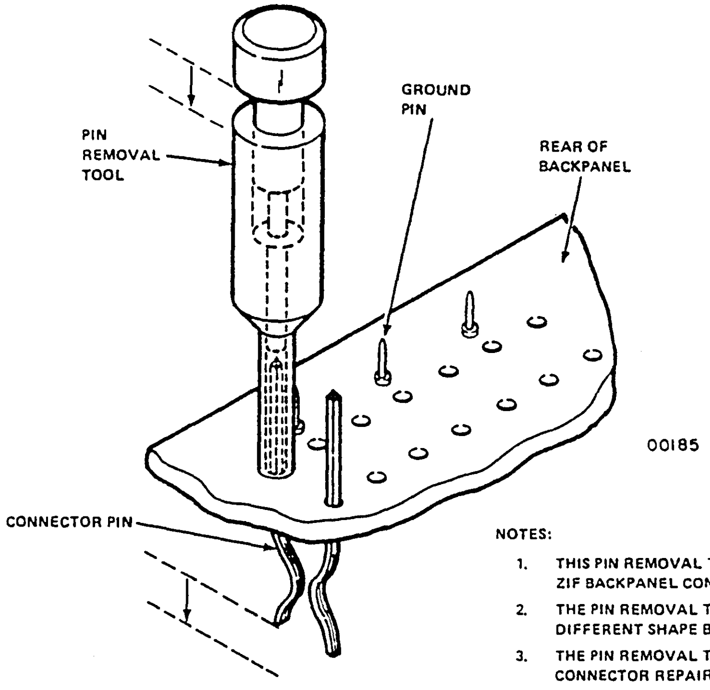
8. At rear of backpanel, pull cable connnector off defective pin.

9. Remove defective pin from backpanel using pin removal tool or pin extraction tool from backpanel repair tool kit. You can use pin removal tool only for signal pins and cable connector ground pins, but you can use pin extraction tool for all pins.

Pin Removal Tool

a. Place sheet of paper under front of connector to catch pin.

b. At rear of backpanel, set pin removal tool over pin to be removed. If support rod between interconnect boards interferes with installation of tool, remove support rod.



NOTES:

1. THIS PIN REMOVAL TOOL IS FOR USE WITH THE ZIF BACKPANEL CONNECTOR PINS.
2. THE PIN REMOVAL TOOL FOR CM HAS A SLIGHTLY DIFFERENT SHAPE BUT IS USED IN THE SAME WAY.
3. THE PIN REMOVAL TOOL IS PART OF THE CONNECTOR REPAIR KIT.

Pin Removal Tool

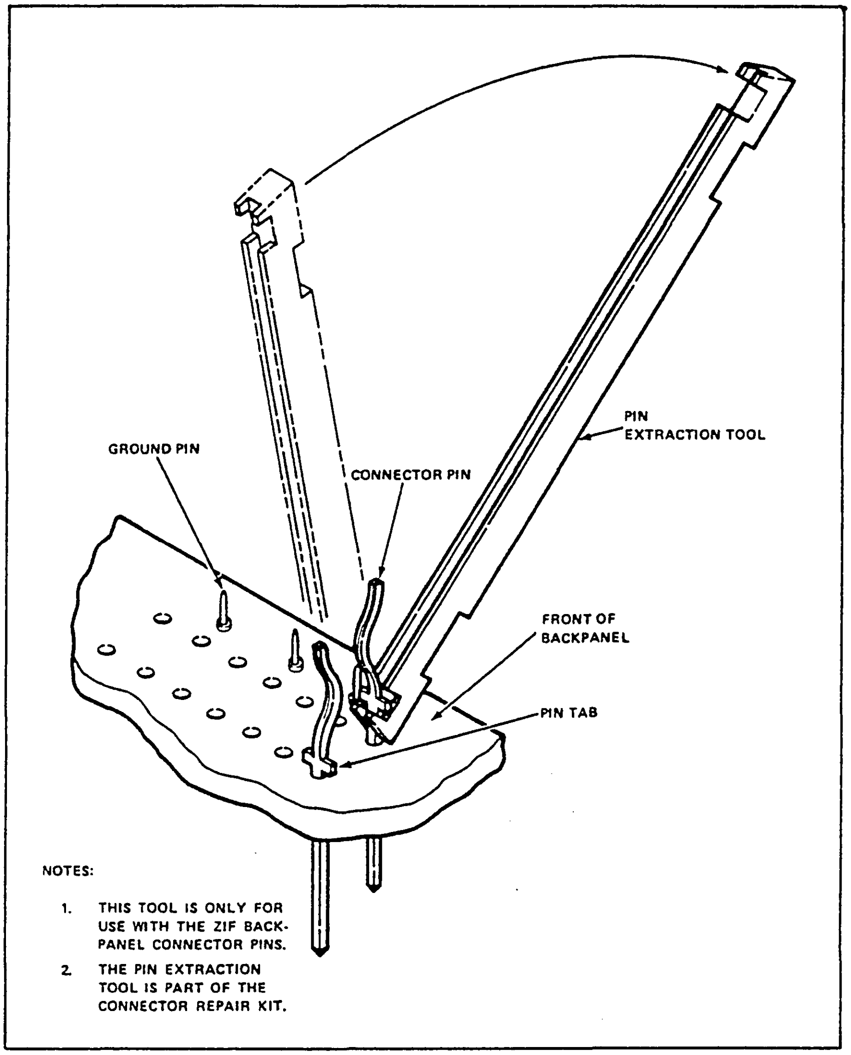
c. Push pin out of backpanel by tapping end of pin removal tool lightly with plastic-head hammer.

d. Remove pin from front of backpanel.

e. Remove sheet of paper.

Pin Extraction Tool

a. At front of backpanel, insert small hooks of pin extraction tool under tabs of pin to be removed.



NOTES:

1. THIS TOOL IS ONLY FOR USE WITH THE ZIF BACKPANEL CONNECTOR PINS.
2. THE PIN EXTRACTION TOOL IS PART OF THE CONNECTOR REPAIR KIT.

Pin Extraction Tool

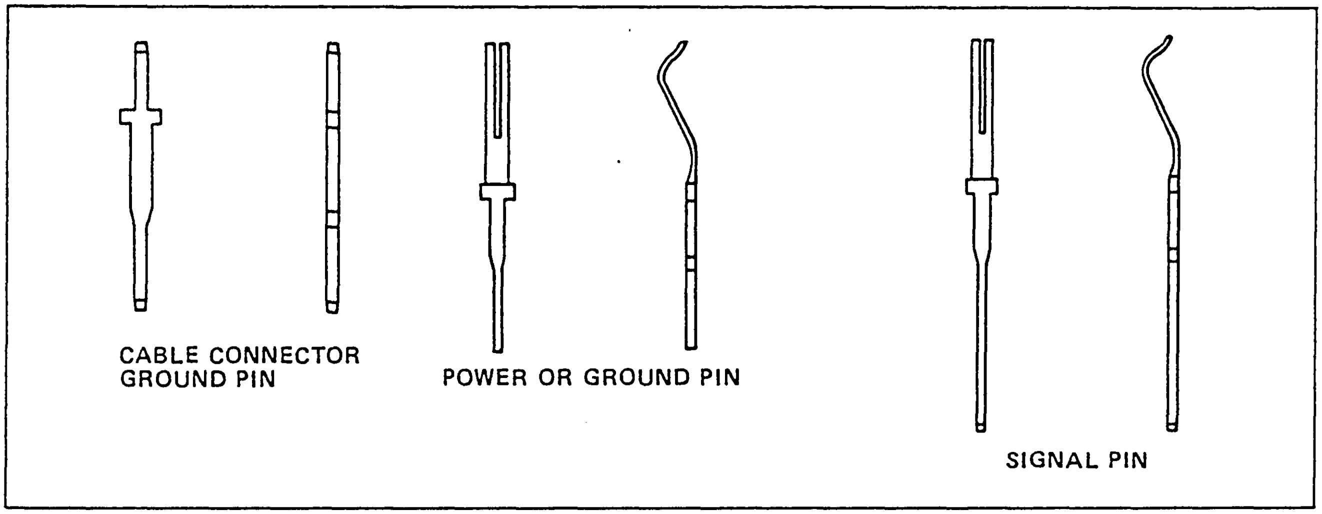
b. Start pin removal by pivoting tool against backpanel and away from pin.

c. Insert large hooks of pin extraction tool under tabs of pin.

d. Finish pin removal by pivoting tool against backpanel and away from pin.

REPLACEMENT

1. Select replacement pin from backpanel repair parts kit.



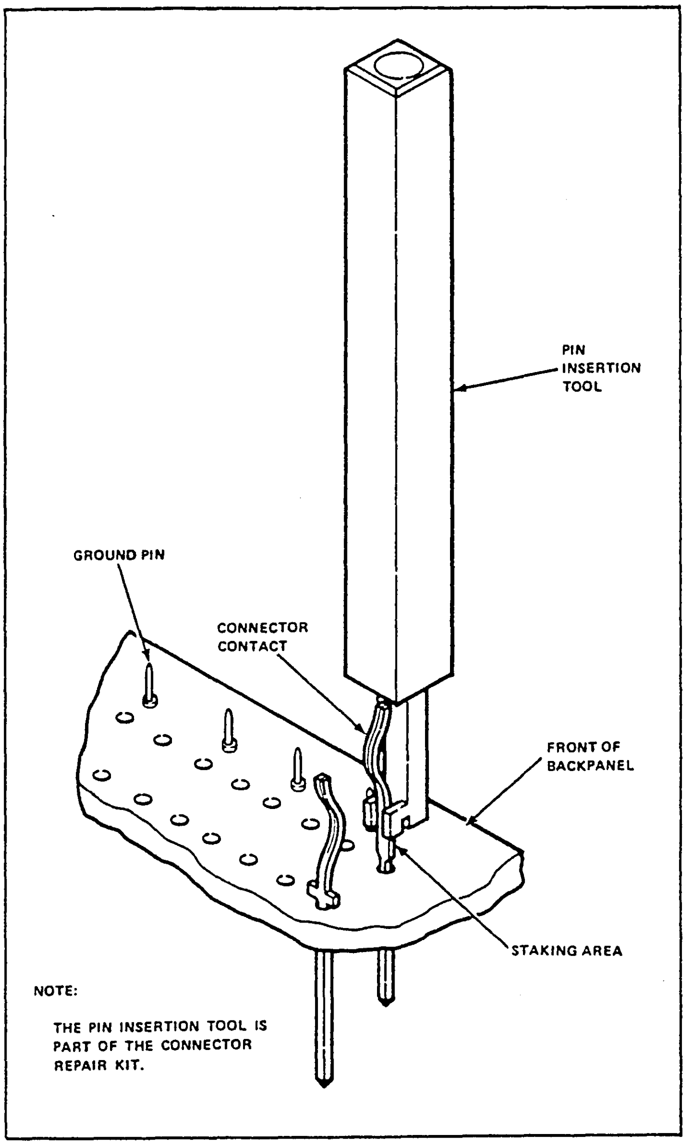
CABLE CONNECTOR GROUND PIN

POWER OR GROUND PIN

SIGNAL PIN

Replacement Pins

2. Place pin in pin insertion tool. Hold top of pin in tool with finger. Pin insertion tool is part of backpanel repair tool kit.



NOTE:

THE PIN INSERTION TOOL IS PART OF THE CONNECTOR REPAIR KIT.

Pin Insertion Tool

3. Insert pin into backpanel as far as it will go without forcing it.

4. Fully seat pin by tapping pin insertion tool lightly with plastic-head hammer.

5. Remove tool and inspect pin. If pin is aligned with other pins, go to step 6. Otherwise, remove it according to step 9 of removal procedure, and replace it.

NOTE

To ensure a tight fit over the pins, use a replacement insulator from the backpanel repair parts kit.

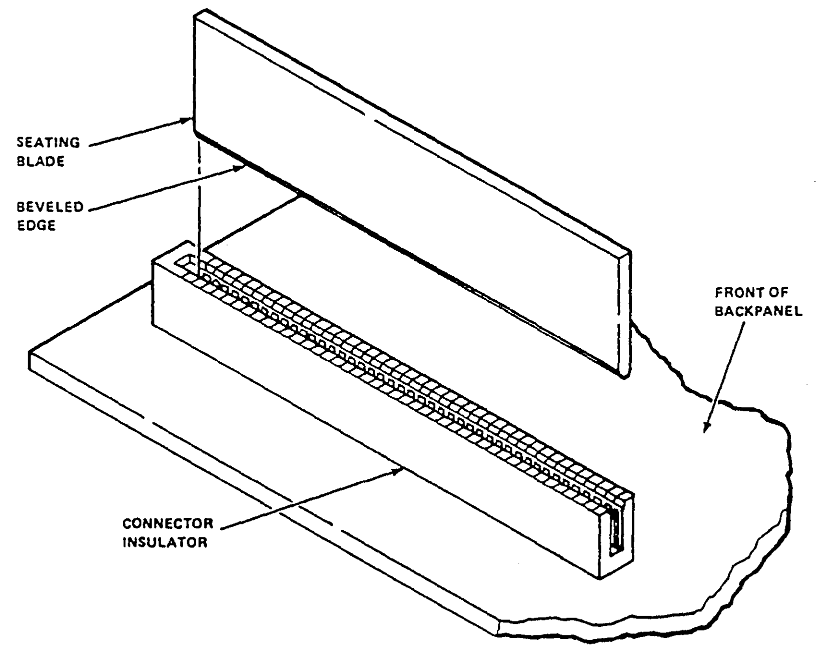
CAUTION

Do not apply any pressure on the replacement insulator. Applying pressure on the insulator severely damages the pins under the insulator that have not been aligned and spread (steps 8 and 9).

6. Select replacement insulator from backpanel repair parts kit, and position insulator loosely over pins.

7. Inspect pins through opening in insulator. If all pins are uniformly in place, go to step 8. Otherwise, remove bent pins according to steps 8 and 9 of removal procedure, and replace them.

8. Align pins in cavities of insulator by lightly inserting beveled edge of seating blade into insulator with rocking motion. Seating blade is part of backpanel repair tool kit.



NOTE:
THE SEATING BLADE IS PART OF THE CONNECTOR REPAIR KIT.

Connector Insulator Installation

9. Spread pins in cavities of insulator by pressing firmly on top of seating blade, sliding it between rows of pins to bottom of insulator.

10. Seat insulator on pins by sharply tapping seating blade several times with plastic-head hammer.

11. Remove seating blade from insulator.

12. Inspect insulator and pins. Insulator must be flush with backpanel and undamaged. Pins must be aligned with cavities and with each other.

13. At rear of backpanel, push cable connnector on pin.

14. If removed, replace support rod between interconnect boards.

15. If removed, replace equipment switch board on back of ZIF cage A according to Procedure 7CX00018, Equipment Switch Board Removal/Replacement.

16. Replace cold plate assembly in ZIF cage according to Procedure 7CX00030, ZIF Cold Plate Assembly (B) Removal/Replacement, or 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement.

17. Apply power to chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

ZIF INTERCONNECT BOARD (B) REMOVAL/REPLACEMENT

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local supply	Drive socket wrench
Local supply	3/16-in socket for socket wrench
Local supply	Phillips screwdriver
Local supply	7/64-in hex head wrench

REFERENCES

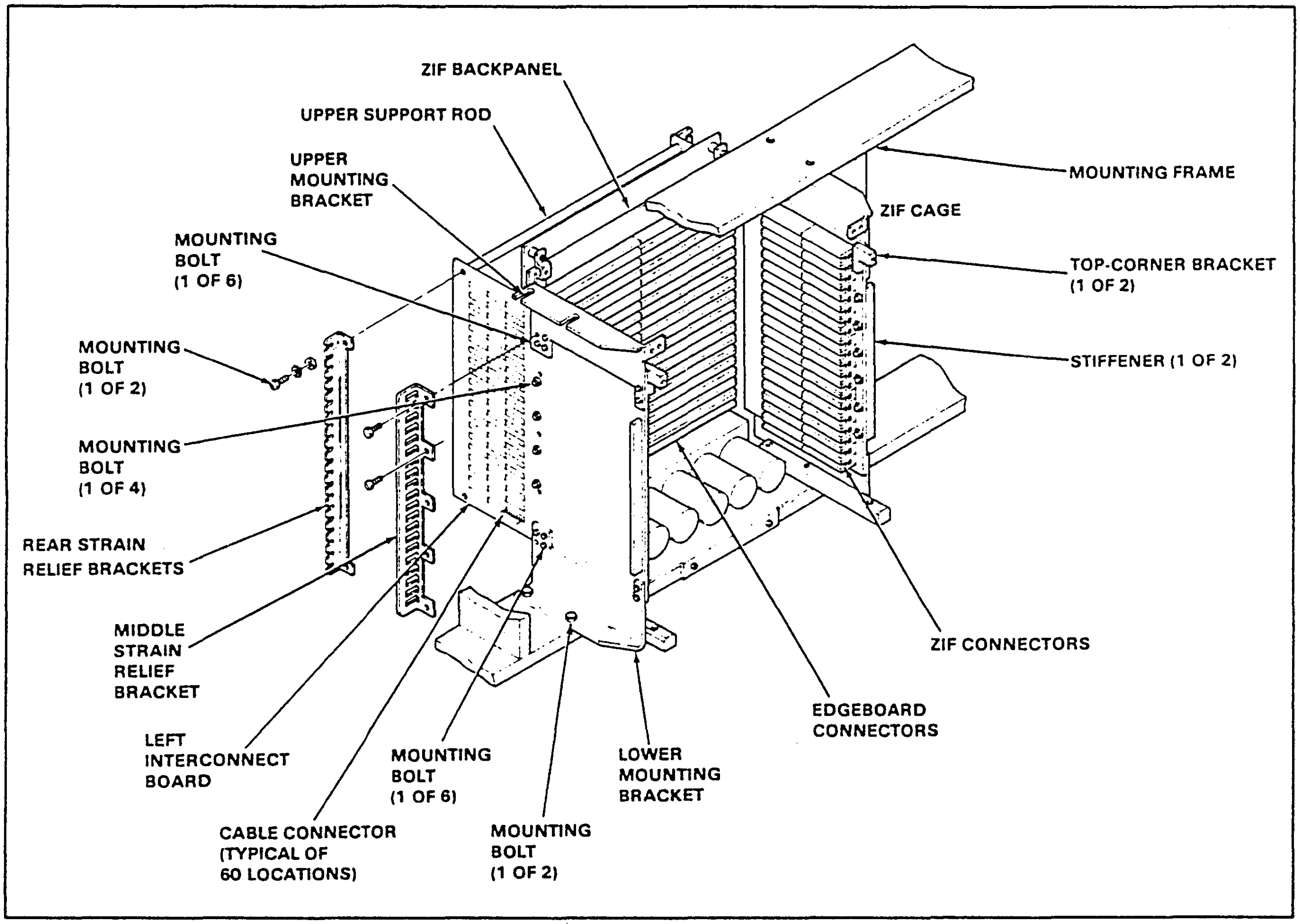
This procedure references the following procedure:

7CX00030	ZIF Cold Plate Assembly (B) Removal/Replacement
7CX00018	Equipment Switch Board Removal/Replacement

INTRODUCTION

The ZIF interconnect board connects ZIF connectors to cable connectors and other ZIF connectors. Each interconnect board contains 40 ZIF connectors and up to 60 cable connectors. The ZIF connectors provide connections for the side connector pads of the 20 ZIF boards. The cable connectors provide connections for coax cables to other logic assemblies. An interconnect board mounts on the right and left sides of each ZIF cage.

This procedure applies to an interconnect board that does not require alignment when it is replaced. Procedure 7CX00039, ZIF Interconnect Board (A) Removal/Replacement, applies to an interconnect board that requires alignment.



ZIF Cage and Interconnect Boards

REMOVAL

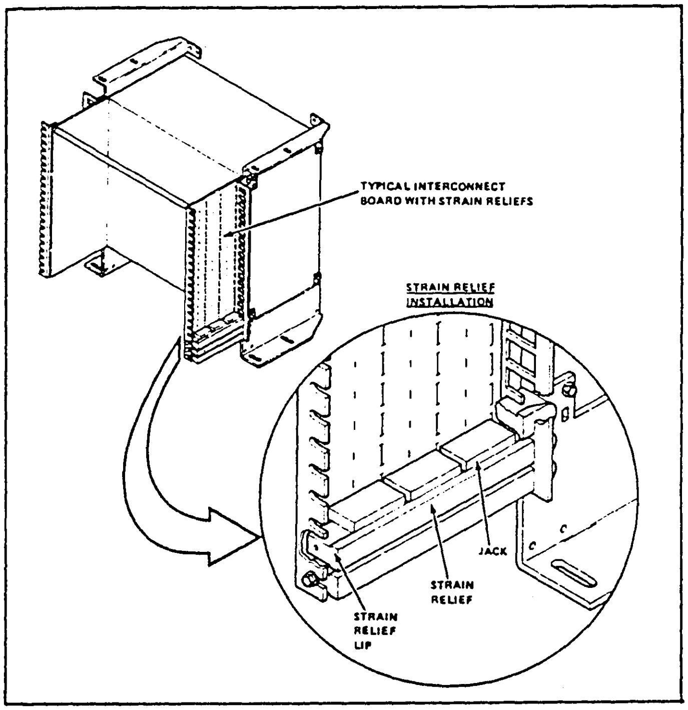
1. Remove cold plate assembly from ZIF cage according to Procedure 7CX00030, ZIF Cold Plate Assembly (B) Removal/Replacement.

NOTE

An equipment switch board may be installed on the back of ZIF cage A. If an interconnect board is being removed from ZIF cage A, remove the equipment switch board (if present) according to Procedure 7CX00018, Equipment Switch Board Removal/Replacement, but do not remove the extension plates from the board.

2. Loosen screws on cable strain reliefs. Use drive socket wrench with 3/16-in socket.

3. Remove cable strain reliefs.

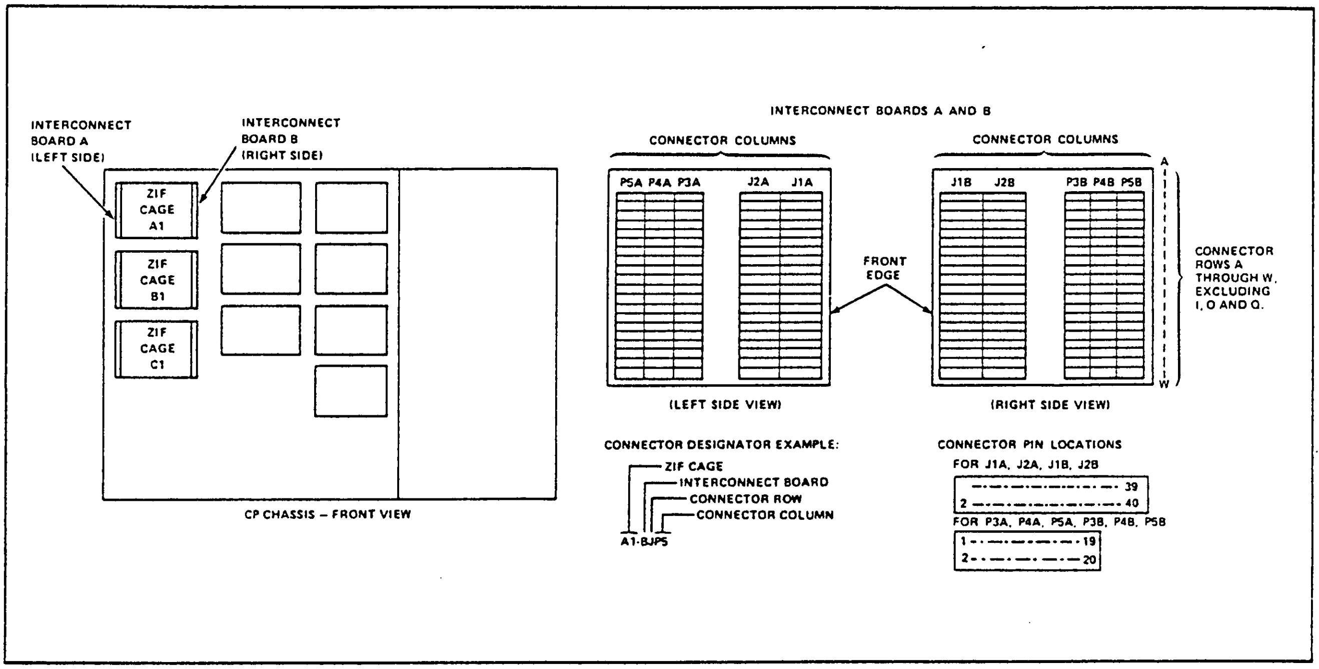

TYPICAL INTERCONNECT BOARD WITH STRAIN RELIEFS
STRAIN RELIEF INSTALLATION
JACK
STRAIN RELIEF
STRAIN RELIEF LIP

Cable Strain Reliefs

NOTE

Label cable connections to interconnect board for later replacement.

4. Unplug connectors from interconnect board.



Interconnect Board Connector Designators

5. Remove rear strain relief bracket by removing screw, lockwasher, and flat washer from upper support rod and lower support rod.

6. Remove middle strain relief bracket by removing five cap screws. Use 7/64-in hex head wrench.

7. Remove front support post by removing five cap screws. Use 7/64-in hex head wrench.

CAUTION

To avoid breaking board modification wires on the cable connector side of the interconnect board, be careful when you handle the board.

8. Remove interconnect board from two mounting pins.

REPLACEMENT

Replacement consists of reversing removal procedure.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
53705483	ZIF chip extender

REFERENCES

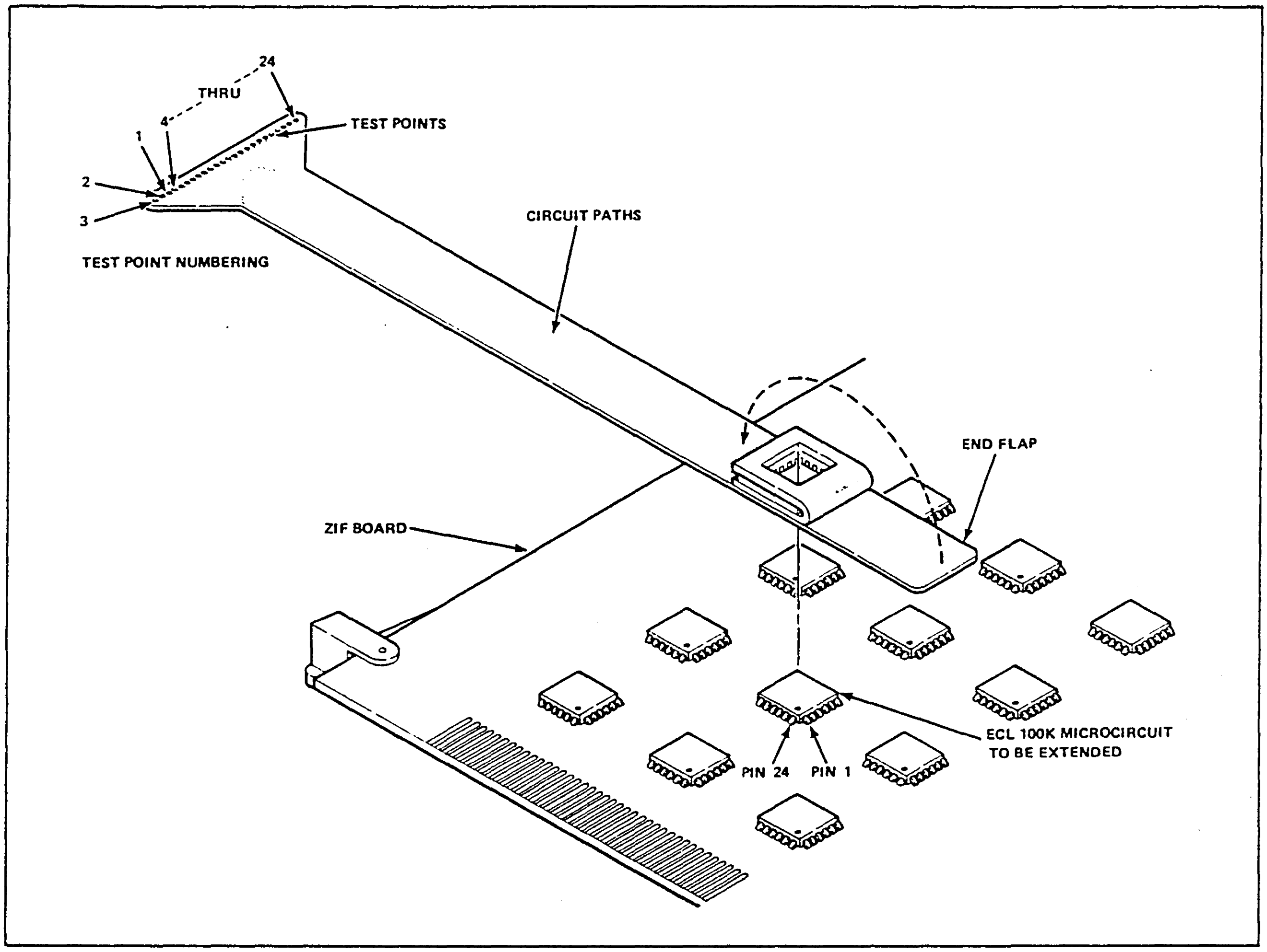
This procedure references the following procedure:

7CX00036 ZIF Board Removal/Replacement

INTRODUCTION

The ZIF chip extender is used to connect an oscilloscope to an ECL 100K microcircuit on a ZIF board in rows B through W. The chip extender fits only over the pins of a microcircuit with no ECOs and extends the pins to the front of the ZIF board. The cold plate above the ZIF board holds the extender in place.

The microcircuits on the ZIF board in row A are accessible by removing the temperature protect board. See Procedure 7CX00033, ZIF Temperature Protect Board (B) Removal/Replacement or Procedure 7CX00040, ZIF Temperature Protect Board (A) Removal/Replacement.



ZIF Chip Extender

INSTALLATON

1. Remove ZIF board from ZIF cage according to Procedure 7CX00036, ZIF Board Removal/Replacement. Leave antistatic wrist strap on and connected to chassis ground.

2. Place chip extender on microcircuit to be tested. Push down on extender to seat it firmly around pins.

NOTE

Fold end flap, if loose, over microcircuit, and hold in place while you replace ZIF board in ZIF cage.

Compress foam in extender to feed it under cold plate.

3. Replace ZIF board in ZIF cage according to Procedure 7CX00036, ZIF Board Removal/Replacement.

REMOVAL

Removal consists of reversing installation procedure.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
22724699	Drain hose
Local supply	38-L (10-gal) container
12210730	10-in adjustable wrench
Local supply	23 L (6 gal) of distilled water
53586616	Funnel
12215195	Disposable gloves
51730100	Safety glasses
53581615	Nalco 2594 microbiocide
53586686	Alkalinity kit
22824498	Cobratec TT-50S corrosion inhibitor

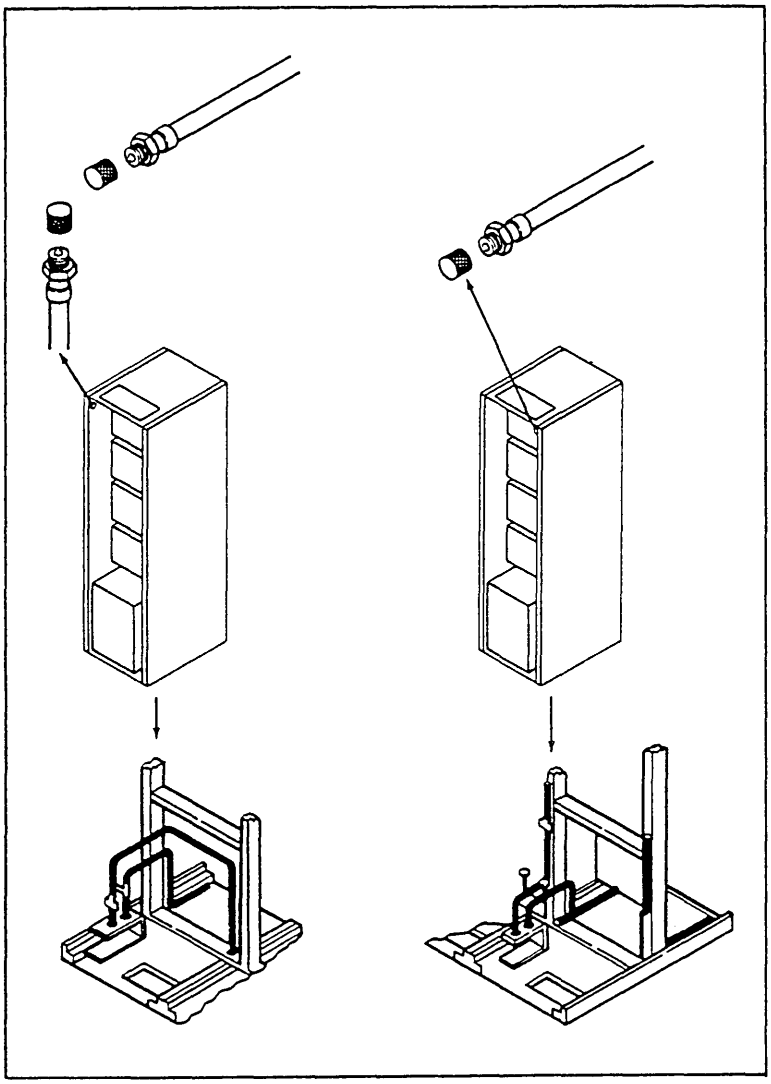
REFERENCES

This procedure references the following procedure:

7CX00009	Chassis Column Power Removal/Application (Power Manual)

INTRODUCTION

Each chassis column contains supply and return water lines that circulate water for cooling the logic assemblies, power transformers, and power diodes in the column. Self-sealing quick-disconnect couplings at the bottom of the water lines allow removable hoses to be connected and disconnected without losing water. The hoses connect the water lines to supply and return manifolds under the raised floor. The hoses and manifolds also have self-sealing quick disconnect couplings. Bleed valves at the top of the water lines allow water to be drained easily.

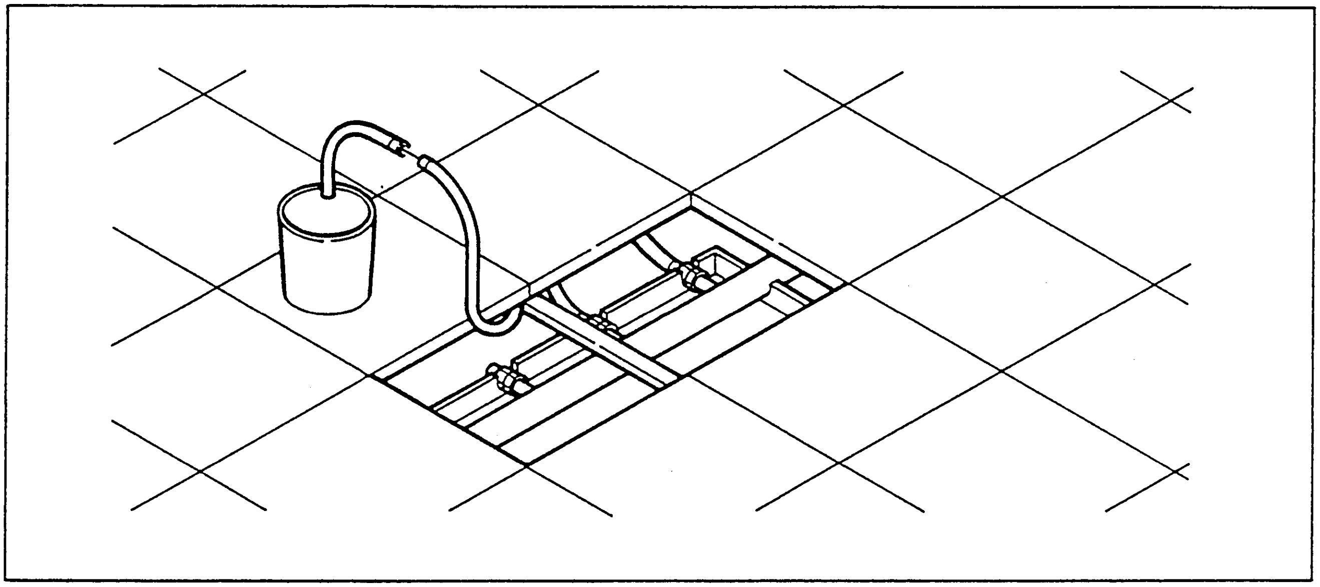


Water Lines and Bleed Valves

DRAINING COLUMN

1. Remove power from chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.
2. Remove floor tile in front of column.

3. Disconnect supply and return water hoses from supply and return manifolds under floor. To release water hose connector, pull back on its outer shell.



Draining Supply Water Line

4. Drain each chassis column water line as follows:

   a. Connect drain hose to end of supply water hose or return water hose. To connect hose, pull back outer shell, push hose onto fitting, and release shell.

   b. Place container under free end of drain hose to catch water from column.

   c. Remove cap from bleed valve.

   d. Drain water from column by pressing bleed valve using finger or screwdriver.

   e. Replace cap on bleed valve.

   f. Disconnect drain hose from supply water hose or return water hose. To release water hose connector, pull back on its outer shell.

FILLING COLUMN

1. Reconnect water hoses to supply and return manifolds. To connect hose, pull back outer shell, push hose onto fitting, and release shell.

2. At water cooling unit, remove fill plug on top of water tank using adjustable wrench.

3. With water cooling unit running, add distilled water to tank using funnel. Add water until liquid level sight glass is three-fourths full. You may not have to add all 23 L (6 gal) of water. Record amount of water added.

WARNING

Nalco 2594 microbiocide causes severe eye and skin irritation. The microbiocide contains polyoxyethylene (dimethyliminio) ethylene (dimethyliminio) ethylene dichloride. Avoid contact with eyes and skin. Wear approved eye and skin protection. Do not inhale vapors or mist. Do not take internally. Use only with adequate ventilation. Keep container closed when not in use.

4. Put on safety glasses and disposable gloves. For each 3.8 L (1 gal) of water added to water cooling unit in step 3, add 4 drops of Nalco 2594 microbiocide to water tank. Allow water to circulate for 15 min.

5. Drain about 60 mL (2 oz) of water from drain valve of water tank.

6. Place alkalinity indicator stick in water, and wait for stick to change color.

7. Compare color of stick to color on alkalinity kit box. If alkalinity is 7 or 8, go to step 8. If alkalinity is less than 7, add Cobratec TT-50S corrosion inhibitor as follows:

WARNING

> Cobratec TT-50S corrosion inhibitor causes severe eye and skin burns. The corrosion inhibitor contains sodium hydroxide solution. Avoid contact with eyes and skin. Wear approved eye and skin protection. Do not inhale vapors or mist. Do not take internally. Use only with adequate ventilation. Keep container closed when not in use.

   a. Put on safety glasses and disposable gloves.

   b. Add 3 drops of corrosion inhibitor to water tank. Allow water to circulate for 30 min.

   c. Repeat steps 5, 6, and 7.

8. Replace fill plug on top of water tank using adjustable wrench.

9. Replace floor tile.

10. Apply power to chassis column according to Procedure 7CX00009, Chassis Column Power Removal/Application.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local supply	Phillips screwdriver
12263496	Antistatic wrist strap (large) with grounding cord
12263623	Antistatic wrist strap (small) with grounding cord
12263499	Antistatic bag
12263495	Antistatic work pad
12263279	John Fluke Model 8020A digital multimeter
Local supply	Gold-Wipes (TEXWIPE TX809)
94211400	Lint-free disposable cloths
12263513	Trichloroethane solvent (16 oz)

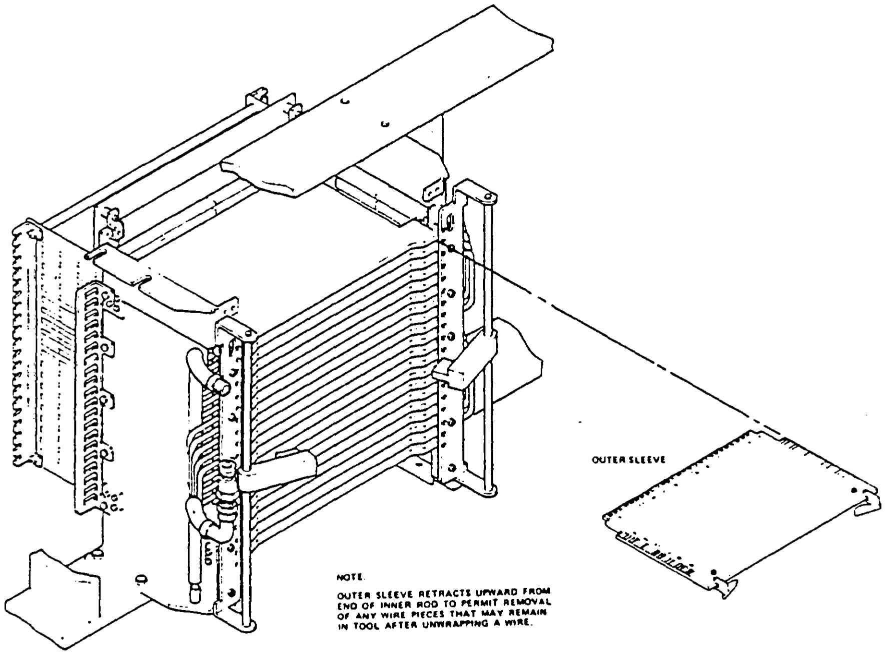
REFERENCES

This procedure references the following procedure:

7CX00009 Chassis Column Power Removal/Application (Power Manual)

INTRODUCTION

ZIF boards each contain up to 98 ECL 100K series microcircuits. Up to 20 ZIF boards mount in specified locations of a ZIF cage. The removal and replacement procedures are the same for all ZIF boards.


OUTER SLEEVE
NOTE.
OUTER SLEEVE RETRACTS UPWARD FROM END OF INNER ROD TO PERMIT REMOVAL OF ANY WIRE PIECES THAT MAY REMAIN IN TOOL AFTER UNWRAPPING A WIRE.

ZIF Cage and ZIF Boards

CAUTION

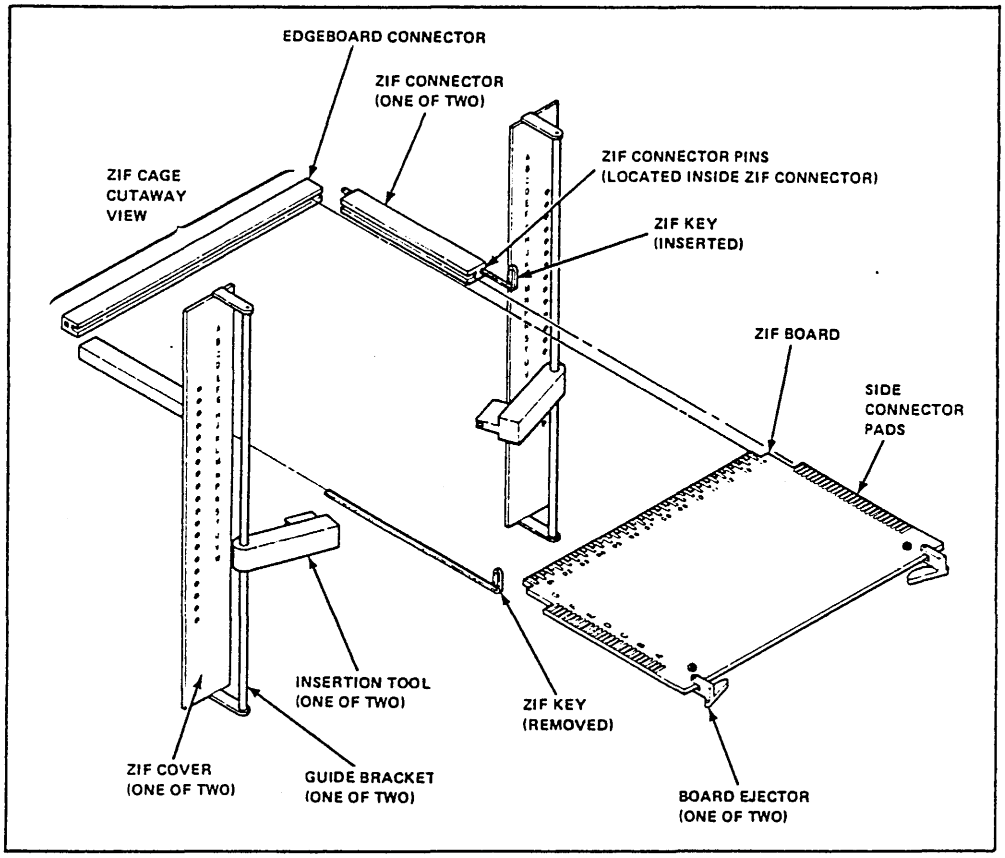
To avoid destroying static-sensitive parts, follow the antistatic precautions listed in this procedure.

REMOVAL

1. Remove power from chassis column containing ZIF cages according to Procedure 7CX00009, Chassis Column Power Removal/Application.

2. Put on antistatic wrist strap, and connect it to chassis ground.

3. Insert ZIF key into ZIF connector on each side of ZIF board.


EDGEBOARD CONNECTOR
ZIF CONNECTOR (ONE OF TWO)
ZIF CONNECTOR PINS (LOCATED INSIDE ZIF CONNECTOR)
ZIF CAGE CUTAWAY VIEW
ZIF KEY (INSERTED)
ZIF BOARD
SIDE CONNECTOR PADS
INSERTION TOOL (ONE OF TWO)
ZIF KEY (REMOVED)
ZIF COVER (ONE OF TWO)
GUIDE BRACKET (ONE OF TWO)
BOARD EJECTOR (ONE OF TWO)

ZIF Board Removal and Replacement

4. Open both ZIF connectors by turning right ZIF key 90° clockwise (CW) and left ZIF key 90° counterclockwise (CCW).

5. Unseat ZIF board from edgeboard connector by simultaneously pulling both board ejectors outward from board.

CAUTION

To prevent corrosion of the side connector pads, avoid touching them.

6. Slide board straight out of ZIF cage. Place board in antistatic bag.

REPLACEMENT

1. Inspect pins in ZIF connector on each side of ZIF board slot. Open any stuck pins.
2. Put on antistatic wrist strap. If ZIF board is new or is being replaced without rework, go to step 3. Otherwise, test board for short circuits as follows:
   a. Place board (in its antistatic bag) on work surface fitted with antistatic pad connected to raised-floor grid ground.

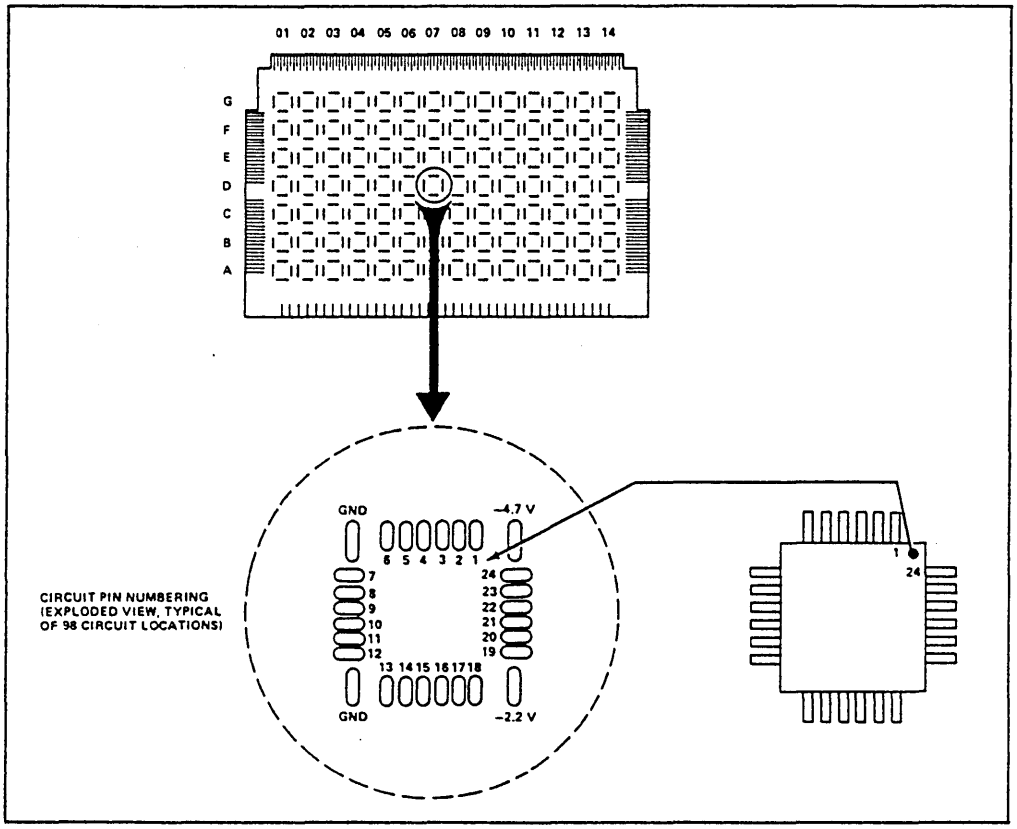
   b. Connect wrist strap to antistatic pad. Remove board from its bag.

CAUTION

To prevent microcircuit damage during short-circuit testing, use only a John Fluke Model 8020A digital multimeter switched to an ohms scale.

   c. Test board for short circuits with Fluke multimeter. Test any circuit between ground and a -2.2 V pin (expect 17 to 18 ohms), ground and a -4.7 V pin (expect 75 to 80 ohms), and between a -2.2 V pin and a -4.7 V pin. Correct any short circuits.

   d. Place board in its bag. Disconnect wrist strap from antistatic pad.



ZIF Board Circuit Pin Identification

3. Carry board, in its bag, to ZIF cage. Connect wrist strap to chassis ground.

4. Remove board from its bag. Clean side connector pads using Gold-Wipes or a lint-free disposable cloth moistened with trichloroethane solvent. Wipe pads toward edge of board to avoid snagging cloth fibers on pad traces.

CAUTION

To prevent damage to a ZIF connector pin, do not insert a ZIF board into a closed or partially closed ZIF connector.

5. Slide board straight into slot in ZIF cage until rear connector pad touches edgeboard connector. If board binds, free it by moving it slightly from side to side.

6. Position grooved end of insertion tools against edge of ZIF board. Insertion tools are on guide brackets on sides of ZIF cage.

7. Seat board in edgeboard connector by simultaneously pushing both insertion tools toward board.

8. Fully seat board in edgeboard connector by simultaneously pushing both board ejectors toward board with thumbs.

9. Close ZIF connectors by turning right ZIF key 90° CCW and left ZIF key 90° CW.

NOTE

If a problem occurs after you replace a ZIF board, open and close the ZIF connectors several times to free a stuck connector pin or clear a pin of contamination.

PROCEDURE 7CX00038-A ZIF COLD PLATE ASSEMBLY (A) REMOVAL/REPLACEMENT Sheet 1 of 3

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local supply	7/8-in open-end wrench
Local supply	3/4-in open-end wrench
Local supply	Drive socket wrench
Local supply	3/16-in socket for socket wrench
Local supply	3/8-in open-end or box-end wrench

REFERENCES

This procedure references the following procedures:

7CX00009	Chassis Column Power Removal/Application (Power Manual)
7CX00040	ZIF Temperature Protect Board (A) Removal/Replacement
7CX00036	ZIF Board Removal/Replacement
7CX00035	Chassis Column Water Draining/Filling
7CX00010	Chassis Column Current Limit Test

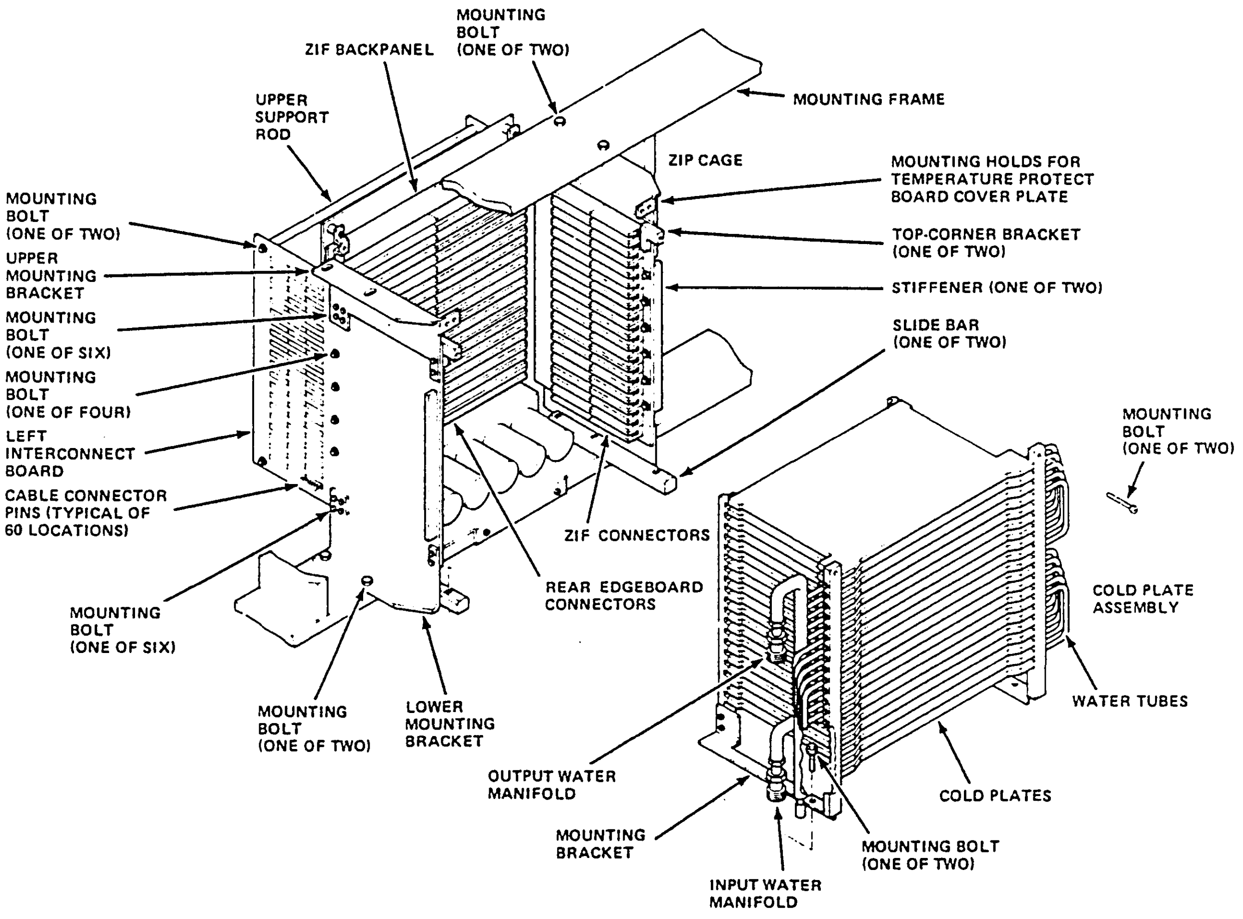
INTRODUCTION

Each ZIF cage contains a removable cold plate assembly, which consists of 20 cold plates and interconnecting water tubes.

The cold plates absorb heat from the ZIF boards mounted in the ZIF cage. Each ZIF board contacts 1 of the 20 cold plates.

The water tubes circulate cooling water through the cold plates. The tubes connect to a supply water manifold on the lower left side of the cold plate assembly and to a return water manifold on the upper left side of the cold plate assembly. Removable hoses connect the water manifolds to the supply and return water lines on the left side of the chassis column. Removable hoses connect the water lines to a water cooling unit.

This procedure applies to a cold plate assembly with the supply and return manifolds on the left side of the assembly. Procedure 7CX00030, ZIF Cold Plate Assembly (B) Removal/Replacement, applies to a cold plate assembly with the supply and return manifolds on opposite sides of the assembly.


MOUNTING BOLT (ONE OF TWO)
ZIF BACKPANEL
UPPER SUPPORT ROD
MOUNTING FRAME
ZIP CAGE
MOUNTING HOLDS FOR TEMPERATURE PROTECT BOARD COVER PLATE
MOUNTING BOLT (ONE OF TWO)
UPPER MOUNTING BRACKET
TOP-CORNER BRACKET (ONE OF TWO)
STIFFENER (ONE OF TWO)
MOUNTING BOLT (ONE OF SIX)
SLIDE BAR (ONE OF TWO)
MOUNTING BOLT (ONE OF FOUR)
LEFT INTERCONNECT BOARD
MOUNTING BOLT (ONE OF TWO)
CABLE CONNECTOR PINS (TYPICAL OF 60 LOCATIONS)
ZIF CONNECTORS
MOUNTING BOLT (ONE OF SIX)
REAR EDGEBOARD CONNECTORS
COLD PLATE ASSEMBLY
MOUNTING BOLT (ONE OF TWO)
LOWER MOUNTING BRACKET
WATER TUBES
OUTPUT WATER MANIFOLD
COLD PLATES
MOUNTING BRACKET
MOUNTING BOLT (ONE OF TWO)
INPUT WATER MANIFOLD

ZIF Cage and Cold Plate Assembly

REMOVAL

1. Drain water from chassis column according to Procedure 7CX00035, Chassis Column Water Draining/Filling.
2. Remove temperature protect board according to Procedure 7CX00040, ZIF Temperature Protect Board (A) Removal/Replacement.
3. Remove all ZIF boards from ZIF cage according to Procedure 7CX00036, ZIF Board Removal/Replacement.
4. Close all ZIF connectors by turning right ZIF keys 90° counterclockwise and left ZIF keys 90° clockwise.
5. Remove all ZIF keys from ZIF cage.

CAUTION

To avoid water damage to electronic components, place sheets of paper over power distribution (PD) box and ZIF cages below cold plate assembly being removed.

6. Disconnect water hoses from supply and return water lines on left side of chassis column. Turn hose fitting with 7/8-in open-end wrench while holding water line fitting with 3/4-in open-end wrench.

7. Remove two mounting bolts from top-corner brackets of ZIF cage. Use drive socket wrench with 3/16-in socket.

8. Remove two mounting bolts from slide bars of ZIF cage. Use 3/8-in open-end or box-end wrench.

CAUTION

Use care in removing cold plate assembly from ZIF cage. Assembly weighs about 15 kg (34 lb).

9. Remove cold plate assembly from ZIF cage by grasping it firmly by guide brackets, sliding it forward to get one hand under it, and lifting it from ZIF cage.

REPLACEMENT

Replacement consists of reversing removal procedure. In addition, test chassis column for short circuits according to Procedure 7CX00010, Chassis Column Current Limit Test, after you replace ZIF boards and temperature protect board.

REQUIRED ITEMS

The following items are required for this procedure:

Part Number	Item
Local supply	Drive socket wrench
Local supply	3/16-in socket for socket wrench
Local supply	Phillips screwdriver.
Local supply	3/8-in box-end wrench
Local supply	3/16-in box-end wrench
Local supply	Flat-blade screwdriver
23004652	ZIF gauge plate
12210945	Dental mirror
12215145	High intensity light

REFERENCES

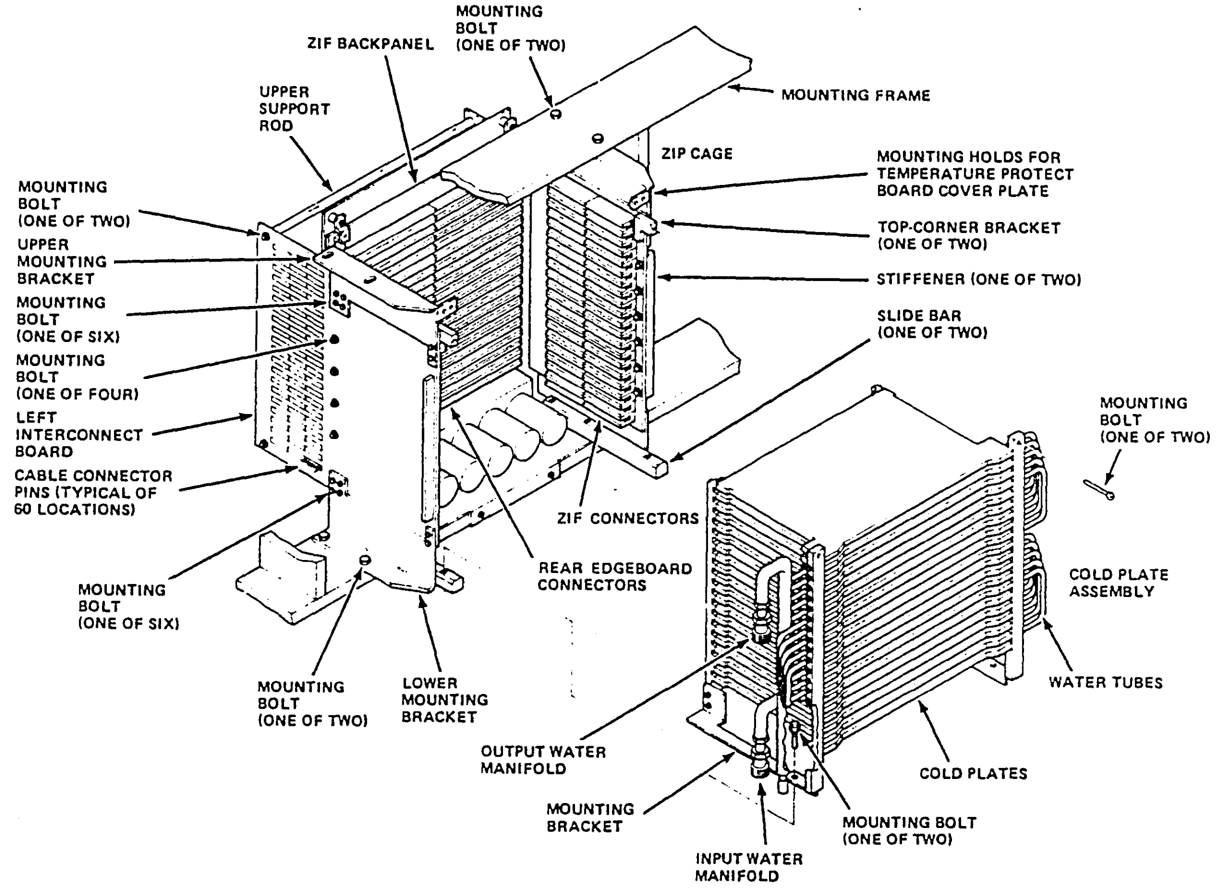
This procedure references the following procedure:

7CX00038	ZIF Cold Plate Assembly (A) Removal/Replacement
7CX00018	Equipment Switch Board Removal/Replacement

INTRODUCTION

The ZIF interconnect board connects ZIF connectors to cable connectors and other ZIF connectors. Each interconnect board contains 40 ZIF connectors and up to 60 cable connectors. The ZIF connectors provide connections for the side connector pads of the 20 ZIF boards. The cable connectors provide connections for coax cables to other logic assemblies. An interconnect board mounts on the right and left sides of each ZIF cage.

This procedure applies to an interconnect board that requires alignment when it is replaced. Procedure 7CX00032, ZIF Interconnect Board (B) Removal/Replacement, applies to an interconnect board that does not require alignment.


MOUNTING BOLT (ONE OF TWO)
ZIF BACKPANEL
MOUNTING FRAME
UPPER SUPPORT ROD
ZIP CAGE
MOUNTING HOLDS FOR TEMPERATURE PROTECT BOARD COVER PLATE
MOUNTING BOLT (ONE OF TWO)
TOP-CORNER BRACKET (ONE OF TWO)
UPPER MOUNTING BRACKET
STIFFENER (ONE OF TWO)
MOUNTING BOLT (ONE OF SIX)
SLIDE BAR (ONE OF TWO)
MOUNTING BOLT (ONE OF FOUR)
LEFT INTERCONNECT BOARD
MOUNTING BOLT (ONE OF TWO)
CABLE CONNECTOR PINS (TYPICAL OF 60 LOCATIONS)
ZIF CONNECTORS
REAR EDGEBOARD CONNECTORS
COLD PLATE ASSEMBLY
MOUNTING BOLT (ONE OF SIX)
WATER TUBES
MOUNTING BOLT (ONE OF TWO)
LOWER MOUNTING BRACKET
OUTPUT WATER MANIFOLD
COLD PLATES
MOUNTING BRACKET
MOUNTING BOLT (ONE OF TWO)
INPUT WATER MANIFOLD

ZIF Cage and Interconnect Boards

CAUTION

Replacing an interconnect board requires exacting alignment. To prevent damage to the interconnect board or the backpanel pins, follow this procedure.

REMOVAL

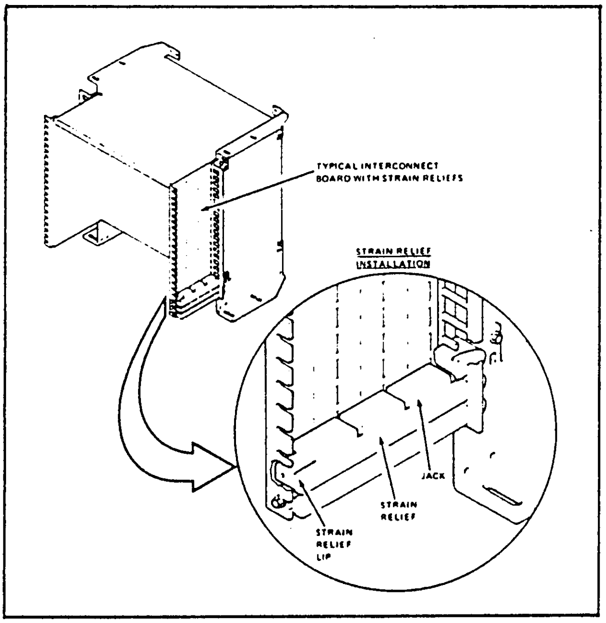
1. Remove cold plate assembly from ZIF cage according to Procedure 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement.

NOTE

An equipment switch board may be installed on the back of ZIF cage A. If an interconnect board is being removed from ZIF cage A, remove the equipment switch board (if present) according to Procedure 7CX00018, Equipment Switch Board Removal/Replacement, but do not remove the extension plates from the board.

2. Loosen screws on cable strain reliefs. Use drive socket wrench with 3/16-in socket.

3. Remove cable strain reliefs.

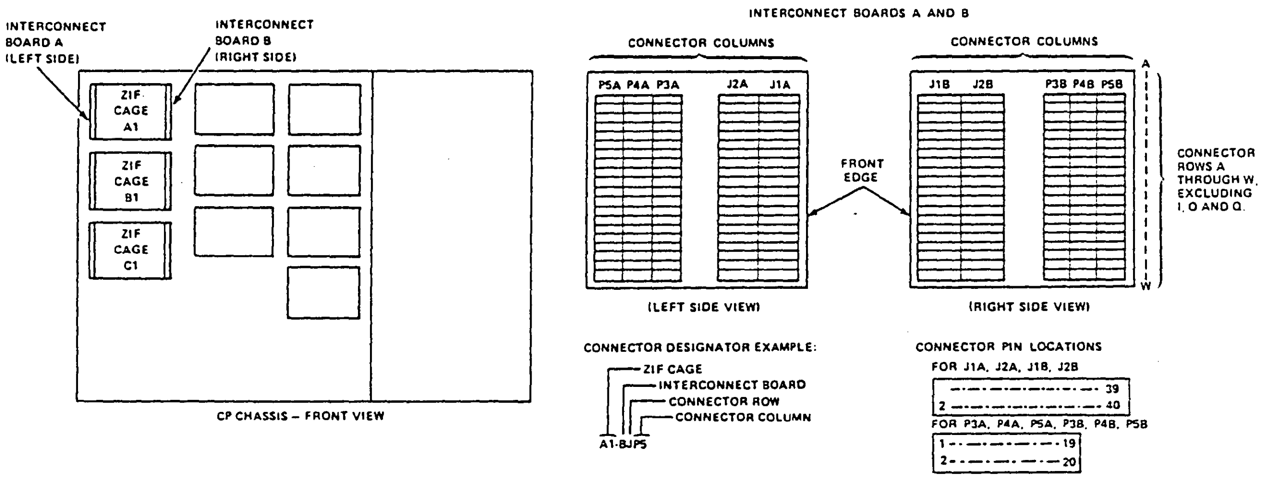

TYPICAL INTERCONNECT BOARD WITH STRAIN RELIEFS
STRAIN RELIEF INSTALLATION
JACK
STRAIN RELIEF
STRAIN RELIEF LIP

Cable Strain Reliefs

NOTE

Label cable connections to interconnect board for later replacement.

4. Unplug connectors from interconnect board.



Interconnect Board Connector Designators

5. Remove rear strain relief bracket by removing screw, lockwasher, and flat washer from upper support rod and lower support rod.

6. Remove middle strain relief bracket by removing two mounting bolts and flat washers. Use drive socket wrench with 3/16-in socket.

7. Remove upper mounting bracket from mounting frame by removing two mounting bolts. Use 3/8-in box-end wrench.

8. Remove lower mounting bracket from mounting frame by removing two mounting bolts. Use 3/8-in box-end wrench.

CAUTION

To avoid breaking board modification wires on the cable connector side of the interconnect board, be careful when you handle the board.

9. Remove upper mounting bracket and top-corner bracket from interconnect board by removing five mounting bolts and flat washers. Use 3/16-in box-end wrench.

10. Remove lower mounting bracket from interconnect board by removing five mounting bolts and flat washers. Use 3/16-in box-end wrench.

11. Remove four mounting bolts and flat washers from middle of interconnect board. Use 3/16-in box-end wrench.

NOTE

Mark shoulder screw locations for later replacement.

12. Remove interconnect board from ZIF cage by removing three shoulder screws, lockwashers, and nuts from middle of board.

13. If you are replacing removed board with replacement board, remove stiffener from board by removing six screws, lockwashers, and flat washers.

REPLACEMENT

CAUTION

To avoid breaking board modification wires on the cable connector side of the interconnect board, be careful when you handle the board.

1. If removed, install stiffener on replacement interconnect board with six screws, lockwashers, and flat washers.

2. Mount interconnect board loosely on ZIF cage with three shoulder screws, lockwashers, and nuts through marked holes in middle of board.

3. Install four mounting bolts and flat washers loosely through holes in middle of interconnect board. Use 3/16-in box-end wrench.

4. Install lower mounting bracket loosely to mounting frame with two mounting bolts.

5. Install lower mounting bracket loosely to interconnect board with five mounting bolts and flat washers. Use 3/16-in box-end wrench.

6. Install upper mounting bracket and top-corner bracket loosely to interconnect board with five mounting bolts and flat washers. Use 3/16-in box-end wrench.

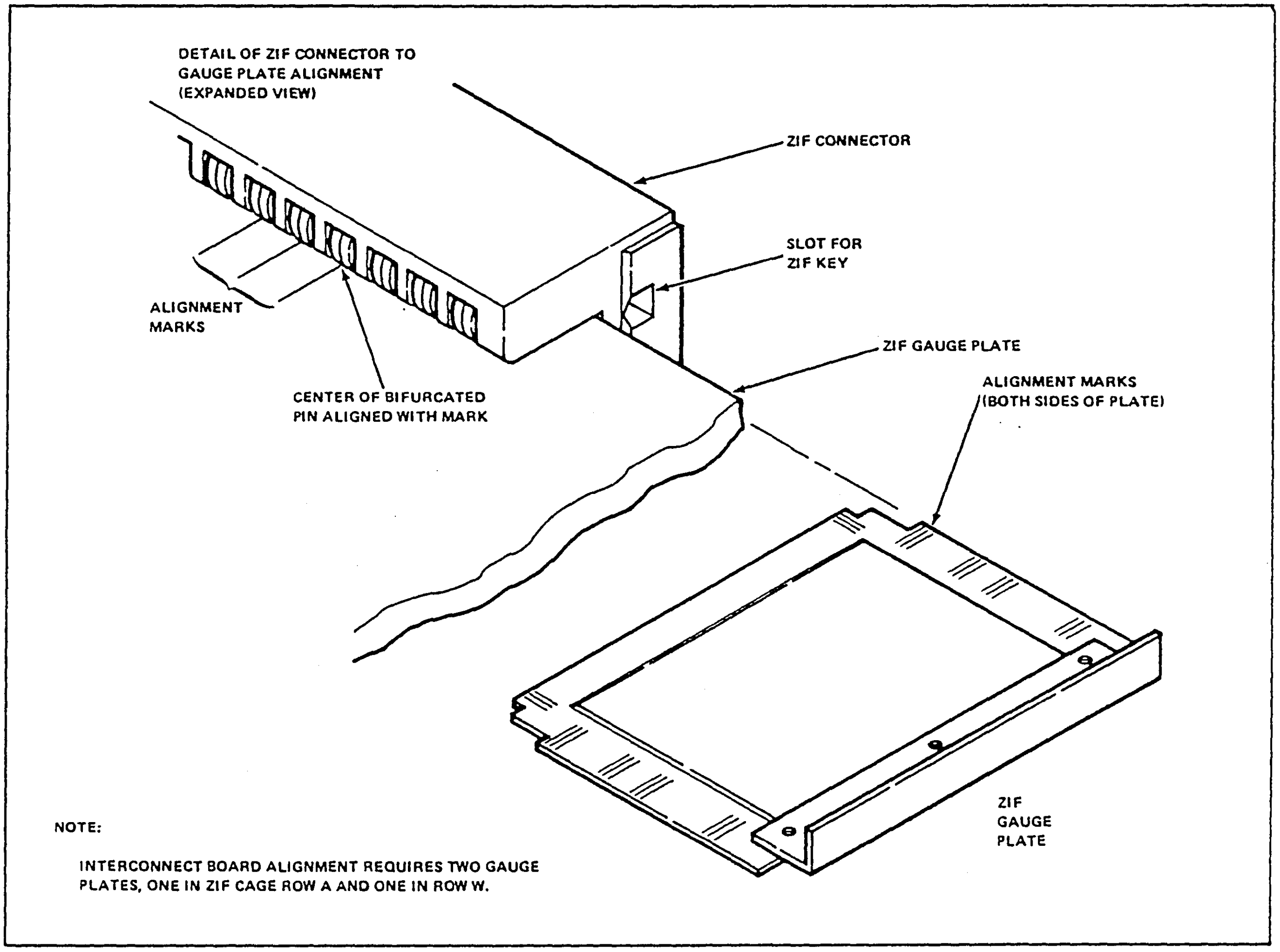
7. Install upper mounting bracket loosely to mounting frame with two bolts.

8. Replace cold plate assembly in ZIF cage according to Procedure 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement, but do not connect hoses, replace ZIF boards, or replace temperature protect board.

9. Insert ZIF key into ZIF connector on each side of ZIF cage rows A and W.

10. Open ZIF connectors by turning right ZIF key 90° clockwise and left ZIF key 90° counterclockwise.

11. Install ZIF gauge plates in rows A and W. Make sure that gauge plate fully seats in edgeboard connector at rear of slot.


DETAIL OF ZIF CONNECTOR TO GAUGE PLATE ALIGNMENT (EXPANDED VIEW)
ZIF CONNECTOR
SLOT FOR ZIF KEY
ALIGNMENT MARKS
ZIF GAUGE PLATE
CENTER OF BIFURCATED PIN ALIGNED WITH MARK
ALIGNMENT MARKS (BOTH SIDES OF PLATE)
ZIF GAUGE PLATE

NOTE:

INTERCONNECT BOARD ALIGNMENT REQUIRES TWO GAUGE PLATES, ONE IN ZIF CAGE ROW A AND ONE IN ROW W.

ZIF Gauge Plate

12. Check horizontal alignment of interconnect board as follows:

NOTE

Two gauge plates establish the vertical alignment of the interconnect board.

a. Check alignment of ZIF connector pins to alignment marks on top of top gauge plate and on bottom of bottom gauge plate. Use dental mirror and high intensity light. If necessary, partially close ZIF connector for better view.

b. If alignment is correct, go to step 13. Otherwise, correct misalignment by moving interconnect board toward front or rear of ZIF cage.

CAUTION

To prevent stripping the threaded holes of the ZIF cage, do not overtighten the bolts that thread directly into the aluminum frame of the ZIF cage.

13. Tighten both groups of three mounting bolts through upper and lower mounting brackets and middle of interconnect board. Use 3/16-in box-end wrench.

14. Tighten four in-line mounting bolts through middle of interconnect board. Use 3/16-in box-end wrench.

15. Tighten three in-line shoulder screws and nuts through middle of interconnect board.

16. Tighten both groups of two mounting bolts through upper and lower mounting brackets and front of interconnect board. Use 3/16-in box-end wrench.

17. Tighten four mounting bolts through upper and lower mounting brackets and mounting frame. Use 3/8-in box-end wrench.

18. Recheck alignment of ZIF connector pins to alignment marks on both gauge plates. If alignment is correct, remove gauge plates, and go to step 19. Otherwise, correct misalignment as follows:

    a. Loosen mounting bolts and screws tightened in steps 13 through 17.

    b. Correct misalignment by moving interconnect board toward front or rear of ZIF cage.

    c. Repeat steps 13 through 18.

19. Replace middle strain relief bracket on interconnect board with two mounting bolts and flat washers. Use drive socket wrench with 3/16-in socket.

20. Replace rear strain relief bracket on interconnect board by installing screw, lockwasher, and flat washer on upper support rod and lower support rod.

21. Replace cable connectors on interconnect board.

22. Replace cable strain reliefs, and tighten screws on end of strain reliefs. Use drive socket wrench with 3/16-in socket.

23. Connect hoses to cold plate assembly, replace ZIF boards, and replace temperature protect board in ZIF cage according to Procedure 7CX00038, ZIF Cold Plate Assembly (A) Removal/Replacement.

BS213-A CLOCK REGULATOR ASSEMBLY REMOVAL/REPLACEMENT

REQUIRED ITEMS

Part Number	Item
Local supply	3/8-in socket set
94657900	Thermal grease (GE 641)

INTRODUCTION

The clock regulator assembly consists of a heat sink and a circuit board which mount to the backpanel at the rear of the cabinet. The regulator assembly receives the -2.2 V and -5.2 V inputs from the clock power supply, regulates the inputs, and distributes them to the system clock and clock fanout circuits. The clock regulator assembly is mounted on the top of the upper card cage, and is accessed from the rear of the cabinet.

REMOVAL

1. Remove power from clock regulator assembly by setting CLOCK SUPPLY DISCONNECT switch on side of clock power supply off (down).
2. Remove two connectors from clock regulator board.
3. Remove six hex head screws holding clock regulator heat sink to cabinet.
4. Remove board from heat sink.

REPLACEMENT

1. Fasten clock regulator board to heat sink.
2. Wipe off excess thermal grease from back of heat sink.
3. Apply thin coat of GE641 thermal grease to heat sink.
4. Insert six hex head screws through heat sink into cabinet. Tighten.
5. Plug two connectors into clock regulator board.
6. Apply power to clock regulator assembly by setting CLOCK SUPPLY DISCONNECT switch on side of clock power supply on (up).

REQUIRED ITEMS

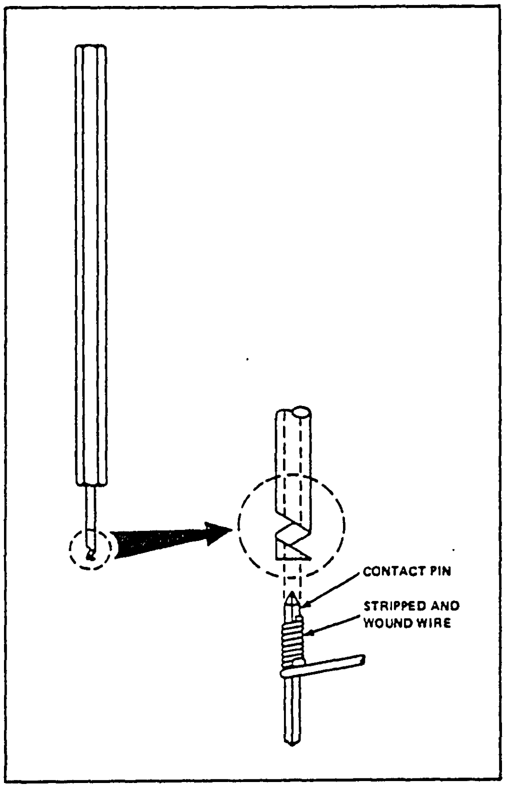
Part Number	Item
12259183	Wire-unwrap tool (30-gauge)
12259111	Wire-wrap gun and bits
12262555	Wire stripper (30-gauge)

INTRODUCTION

This procedure describes how to remove and replace a wire-wrap connection on a backpanel pin.

REMOVAL

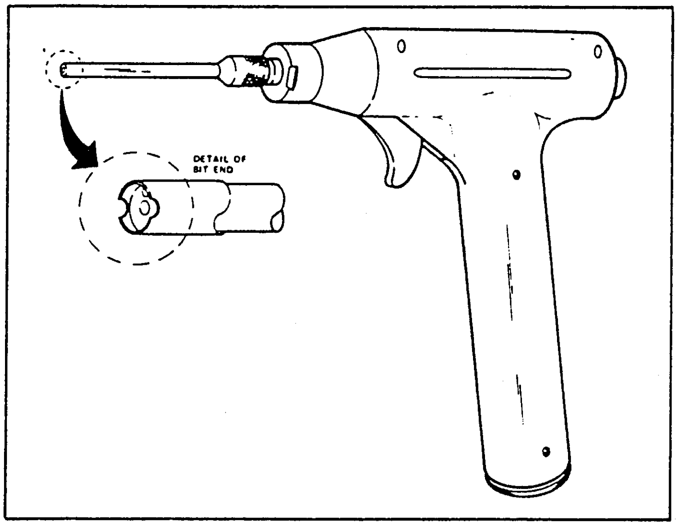
1. Remove power from equipment containing wire to be replaced.
2. Place end of unwrap tool on end of wire-wrap pin that requires wire removal.
3. Push tool gently toward pin while turning tool counterclockwise.
4. Pull tool and wire from wire-wrap pin when wire loosens or unwraps.



Unwrap Tool

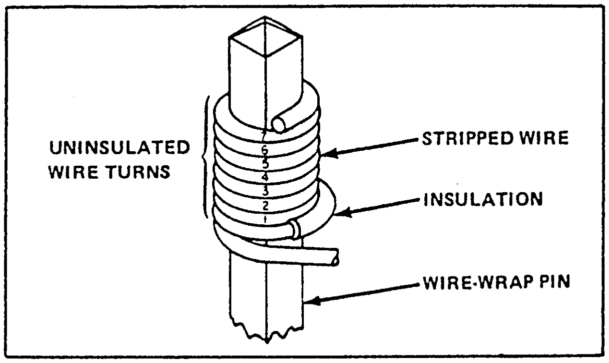
REPLACEMENT

1. Select a wire-wrap bit that fits backpanel pin and size of wire being replaced. Install bit on wire-wrap gun.
2. Strip about 1 in (25 mm) of insulation from end of wire to be wrapped.
3. Insert stripped end of wire as far as it will go into small hole in bit.

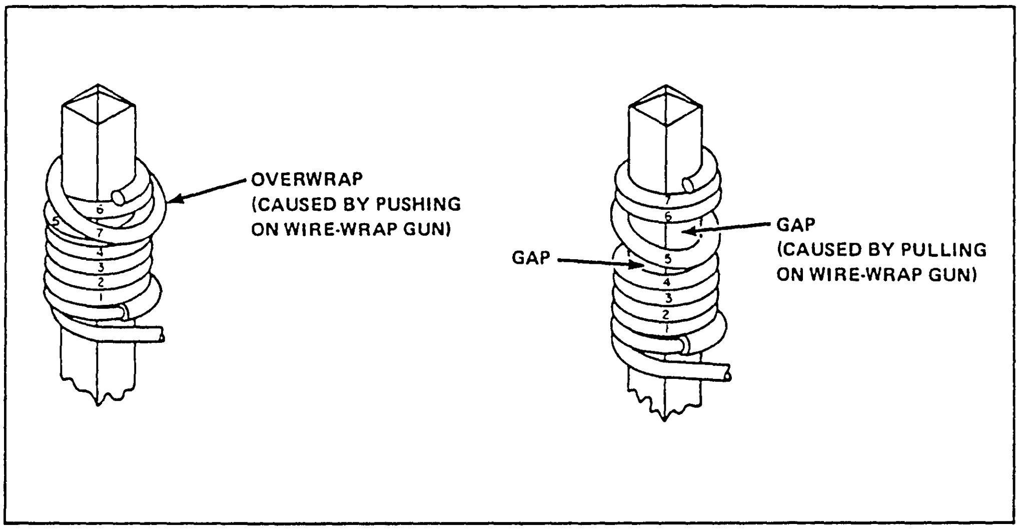


Wire-Wrap Bit Detail

4. Bend wire across end of bit and back against bit shaft, holding wire against shaft.
5. Place large hole in end of bit over wire-wrap pin while keeping wire-wrap gun in line with pin.
6. Apply power to wire-wrap gun. Allow gun to back off pin during wire-wrapping without pushing or pulling on gun.
7. Remove wire-wrap gun completely from pin. Correctly wound wire is tight on pin with seven turns of bare wire and one turn with insulation. Incorrectly wound wire has overlap, is loose, or has gaps.



Correct Wire-Wrap



Incorrect Wire-Wrap

8. Repeat removal steps 2 through 4 and replacement steps 2 through 7 for an incorrectly wrapped wire.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
00218816	LSI panel flatness tool kit
Copy locally	Bowed panel recording data chart

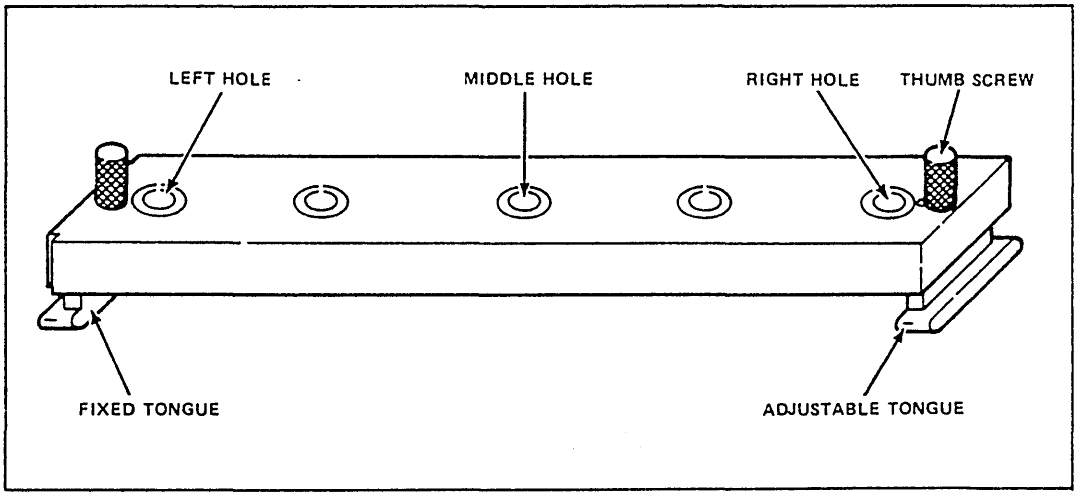
REFERENCES

This procedure references the following procedure.

7CX00008 LSI Panel Removal/Replacement

INTRODUCTION

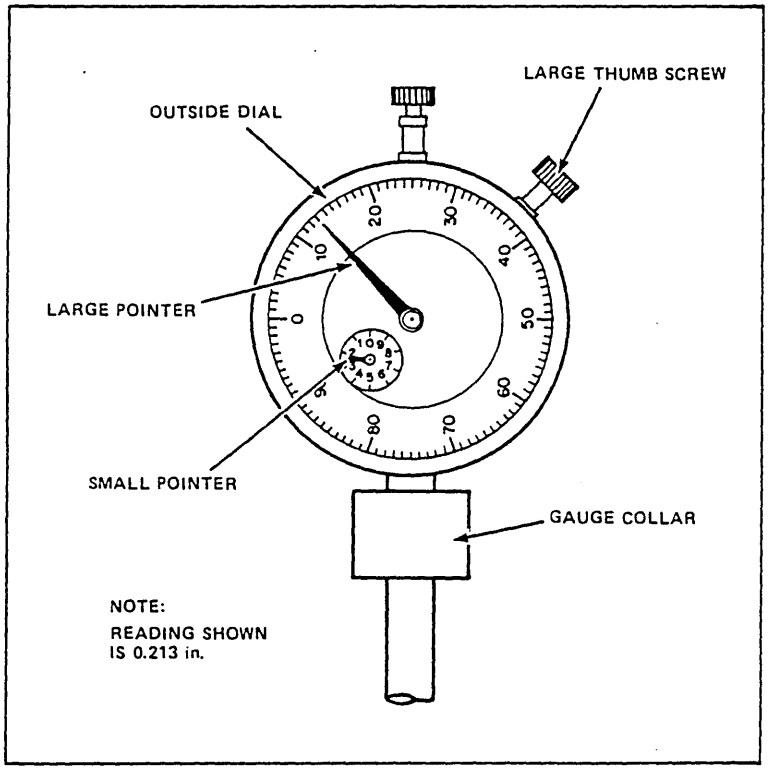
This test determines the flatness of an installed LSI panel. To perform the test, you use a dial gauge to measure the distance between the panel and a flatness tool you install on the LSI panel manifold frame. The complete test involves taking three readings at each of three tool positions for a total of nine readings. After recording distances, you calculate and record the amount of bow at each tool position. If panel bow is excessive, the panel must be removed and reinstalled.



Flatness Tool

DIAL GAUGE

The dial gauge has a range of 0.001 in to 1.000 in. Each graduation on the outer dial represents 0.001 in, and each revolution of the large pointer represents 0.100 in. The small pointer indicates the number of times the large pointer has gone around (tenths of an inch).



NOTE:
READING SHOWN
IS 0.213 in.

Dial Gauge

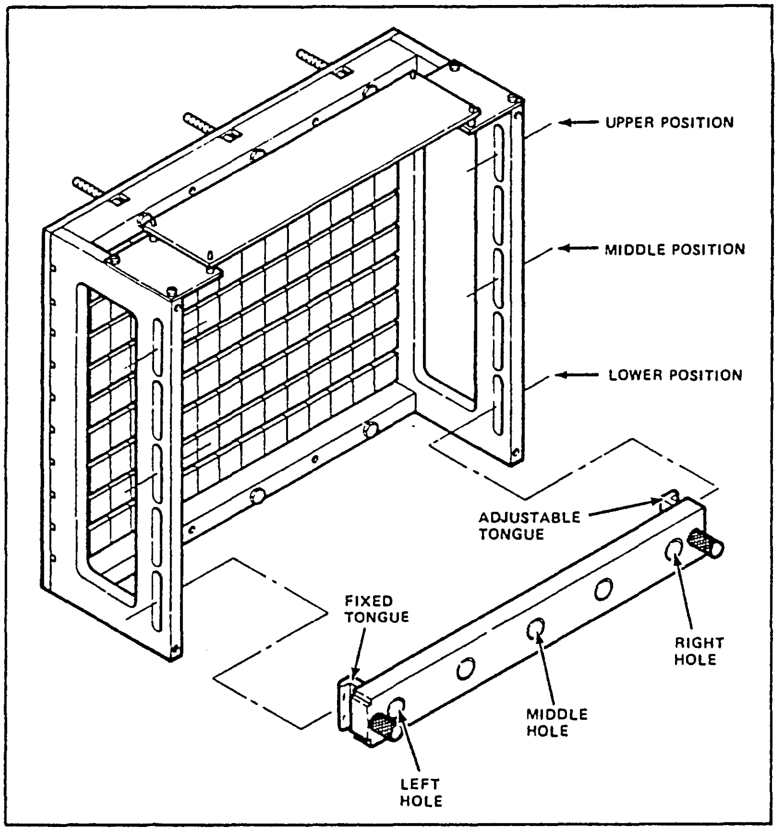
NOTE

This procedure assumes that power is removed from the chassis column containing the panel to be tested, and that the dial gauge is properly calibrated.

TEST PROCEDURE

1. Loosen large thumb screw on side of dial gauge. Rotate outside of dial until pointer indicates zero. Retighten thumb screw.

2. With thumb screws on flatness tool facing you, place fixed tongue of tool in upper left slot of manifold frame. Then place adjustable tongue of flatness tool in upper right slot of manifold frame. Tighten both thumb screws to secure tool to frame.



Flatness Tool Placement on Manifold Frame

3. Insert tip of dial gauge through left hole in flatness tool. Hold gauge collar firmly against tool.

4. Read number of revolutions on small dial and multiply by 0.100 in. For example, if small pointer is between 2 and 3, take smaller number (2) and multiply by 0.100 in, yielding 0.200 in.

5. Read number of graduations indicated by large pointer and multiply by 0.001 in.

6. Add readings obtained in steps 4 and 5. Record sum on copy of Bowed Panel Recording Data Chart.

7. Repeat steps 3 through 6 for middle and right holes in flatness tool.

Serial No: ____________________ Page: ______

Date: ____________________ Maximum bow towards machine: -0.020 in

Operator: ____________________ Maximum bow away from machine: +0.025 in

LSI Panel	Frame Position	Left (L) Reading	Middle (M) Reading	Right (R) Reading	Calculated Bow Value M - ((L+R)/2)
	Upper				
	Middle				
	Lower				
	Upper				
	Middle				
	Lower				
	Upper				
	Middle				
	Lower				
	Upper				
	Middle				
	Lower				
	Upper				
	Middle				
	Lower				
	Upper				
	Middle				
	Lower				

Bowed Panel Recording Data Chart

8. Determine average of left and right readings. Subtract this value from middle reading to determine bow value. Record bow value on data sheet. If bow value is not between +0.025 in and -0.020 in, remove and reinstall LSI panel according to Procedure 7CX00008, LSI Panel Removal/Replacement.

9. Repeat steps 2 through 8 for middle and lower positions of LSI manifold frame.

REQUIRED ITEMS

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord.
12263623	Antistatic wrist strap (small) with grounding cord.
12263499	Antistatic bag

REFERENCES

This procedure references the following procedure:

7CX00043	BS213-A Power Removal/Application
7CX00012	Static Sensitive Parts Handling

INTRODUCTION

Logic and memory array boards are located in the central memory (CM) cabinet. The boards slide in and out of the front of the cabinet on guide rods.

REMOVAL

1. Remove power from cabinet according to Procedure 7CX00043, BS213-A Power Removal/Application

CAUTION

If removing the master oscillator board in location A14, power must be removed from the clock regulator or severe damage to the memory will result. Set CLOCK SUPPLY DISCONNECT switch on side of clock power supply off (down).

CAUTION

Memory array boards are electrostatically sensitive and require careful handling to avoid damage. This handling includes:

- Keeping the boards in protective velostat bags when not installed.
- Avoiding touching individual arrays or their leads when handling the boards.

2. Connect an antistatic wrist strap to wrist and chassis ground.
3. Pull top and bottom extractors on front of board outward at same time to unseat board from rear edgeboard connector.
4. Remove board by sliding it straight out of cabinet.
5. Place board in an antistatic bag.
6. Leave wrist strap connected for replacement.

REPLACEMENT

1. Position board on guide rods at top and bottom of cabinet slot.
2. Slide board into slot until it touches rear edgeboard connector.
3. Seat board connector pad into edgeboard connector by grasping top and bottom cage handles and applying equal inward thumb pressure to board extractors.
4. Disconnect wrist strap.
5. Apply power to cabinet according to Procedure 7CX00043, BS213-A Power Removal/Application.

PROCEDURE 7CX00071-A

BS213-A CENTRAL MEMORY BOARD EXTENDER

Sheet 1 of 2

REQUIRED ITEMS

Part Number	Item
12263496	Antistatic wrist strap (large) with grounding cord.
12263623	Antistatic wrist strap (small) with grounding cord.
12263499	Antistatic bag
52948476	Extender board, logic
91915206	Extender board, memory array

REFERENCES

This procedure references the following procedure:

7CX00043	BS213-A Power Removal/Application
7CX00012	Static Sensitive Parts Handling
7CX00070	BS213-A Central Memory Boards

INTRODUCTION

Logic and memory array boards in central memory (CM) use different board extenders which are not interchangeable because of different power and ground pin assignments. The logic board extender uses ZIF connectors; the array board extender does not. A board extender should only be used after exhausting the use of available board test points and those test points accessible with an oscilloscope probe extender.

INSTALLATION

1. Remove power from cabinet according to Procedure 7CX00043, BS213-A Power Removal/Application.

CAUTION

If removing the master oscillator board in location A14, power must be removed from the clock regulator or severe damage to the memory will result. Set CLOCK SUPPLY DISCONNECT switch on side of clock power supply off (down).

2. Connect an antistatic wrist strap to wrist and chassis ground.

3. Remove board to be extended according to Procedure 7CX00070, BS213-A Central Memory Boards.

4. Position extender vertically, and slide extender into slot until it touches edgeboard connector.

CAUTION

To prevent damage to the extended board, use care to select the correct extender. Logic and memory array boards require different extenders. Each of the two extenders has an identifying word, LOGIC or ARRAY on one side to match it to its usage.

5. Seat extender into cabinet connector by applying equal thumb pressure to top and bottom corners of extender.

6. Insert CM board into extender according to applicable substeps:

For logic boards:

a. Open ZIF connectors on extender by positioning ZIF connector levers perpendicular to extender.

b. Position logic board in extender guides, slide board into open connectors.

c. Close extender ZIF connectors by positioning ZIF connector levers parallel to extender.

For array boards:

a. Position array board on extender board guide rods.

b. Slide board along guide rods until it touches the extender edgeboard connector.

c. Seat array board into extender board by applying equal thumb pressure to top and bottom corners.

7. Disconnect wrist strap unless it has continued use.

REMOVAL

Removal consists of reversing installation procedure.

REQUIRED ITEMS

The following items are required to perform this procedure:

Part Number	Item
00219806	Coax block repair kit (includes 0.136-in x 12 in drill bit with collar, ten repair inserts, insert installation tool, and epoxy adhesive)
22724670	Coax block repair insert
00219807	0.136-in x 12-in drill bit with collar
00219808	Coax block repair insert installation tool
Local supply	Electric hand drill
Local supply	Vacuum cleaner

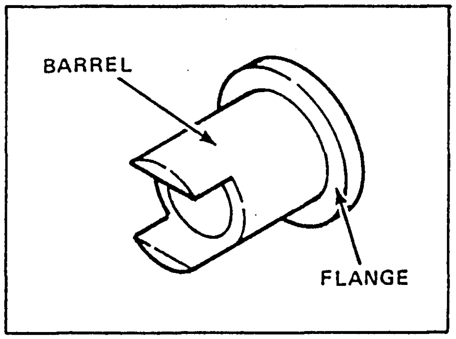
REFERENCES

This procedure references the following procedures.

7CX00009	Chassis Column Power Removal/Application
7CX00022	LSI Coax Wire Connector Removal/Replacement

INTRODUCTION

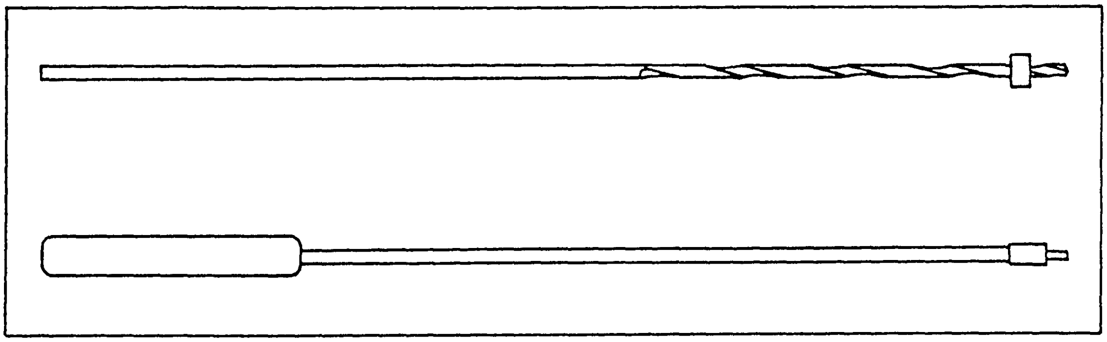
This procedure describes how to install a repair insert in an LSI coax block hole that will no longer retain a coax wire connector. The repair insert is a machined copper alloy bushing that performs the same function as the locking ridges molded into each coax block hole. To repair a damaged hole, drill out the hole and glue in a repair insert.



Coax Block Repair Insert

REPAIR PROCEDURE

1. Remove power from chassis column containing coax block according to Procedure 7CX00009, Chassis Column Power Removal/Application.
2. Remove coax wire connector from damaged hole according to Procedure 7CX00022, LSI Coax Wire Connector Removal/Replacement.
3. Place 0.136-in x 12-in drill bit (with collar) in electric hand drill.
4. Move wire mat to provide drill access to damaged hole.
5. Holding drill bit perpendicular to coax block, drill out damaged hole until collar on drill bit reaches ribs on coax block.
6. Remove drilling debris with vacuum cleaner.
7. Thoroughly mix small amount of epoxy on piece of paper.
8. Place repair insert in its installation tool. Apply two or three drops of mixed epoxy to barrel of repair insert.
9. Push repair insert into hole until insert flange contacts surface of coax block between ribs. Wipe off excess epoxy promptly.
10. Inspect alignment of insert in hole. If insert is misaligned, straighten it with installation tool.
11. Allow epoxy to harden (30 to 60 minutes).
12. Test function of repair insert by installing and removing coax wire connector according to Procedure 7CX00022, LSI Coax Wire Connector Removal/Replacement.
13. Install coax wire connector and reposition wire mat.



Repair Insert Installation Tool and Drill Bit

PARTS DATA

PARTS DATA

The following parts data includes part numbers and descriptions for the CP, CM, and IOU. Supplementary parts data is in the Cooling System and Power Distribution and Warning Systems manuals listed in the preface.

FIELD-AVAILABLE PARTS

The field-available parts are in three kits and a tools list:

- A maintenance kit includes CP, CM, and IOU field-replaceable units (FRUs) that are necessary to achieve a 90% protection level. Listed separately is a small kit containing parts unique to models 840A, 850A, and 860A. These kits are to be available to the computer site within 2 hours.
- A common maintenance kit identifies parts that are common to the models 845S, 855S, 840A, 850A, and 860A central computer systems. The parts in this kit should be considered part of the maintenance kit.
- A diagnostic and installation kit is for troubleshooting during initial equipment installations and for future emergencies. The kit consists of FRUs that complement the maintenance kit. It increases the protection level to 98% at a regional level. This kit is to be available to the computer site within 8 hours.
- A recommended tools list contains special tools for use with the CP, CM, and IOU. It also contains parts for equipment options.

WAREHOUSE-AVAILABLE PARTS

The warehouse-available parts are stocked only in a warehouse because of their cost and failure rate. These parts are documented on two lists: One list contains general purpose parts, the other contains parts associated with LSI board repair. Refer to the recommended tools list for additional LSI board repair parts.

MAINTENANCE KIT CYBER 855M

Quantity	Part Number	Description
5	0011896728	PLASTIC RETAINER LSI CONN 52 PIN
2	0011896729	HEADER ASSY LSI CONN 52 PIN
5	0011896730	RETAINING SPRING LSI CONN 52 PIN
2	0011899082	CONN 26 PIN EDGEBOARD
5	0015185047	THERMISTOR
1	0018906894	MOD ASSY TEMP PROTECT
1	0021946230	PAK ASSY 7UBH
1	0021987669	PAK ASSY 7BBH
1	0022012400	PAK ASSY 9DLH
1	0022012403	PAK ASSY 7ADH
1	0022012409	PAK ASSY 7AFH
1	0022012427	PAK ASSY 7CEH
1	0022012448	PAK ASSY 7CSH
1	0022012451	PAK ASSY 8DDH
1	0022012460	PAK ASSY 7BAH
1	0022013020	PAK ASSY 7BZH
1	0022031203	INTGD CKT 12SC
1	0022031204	INTGD CKT 12SD
1	0022031207	INTGD CKT 12SG
1	0022031209	INTGD CKT 12SI
1	0022031230	ARRAY ASSY 12CA
1	0022031231	ARRAY ASSY 12CB
1	0022031232	ARRAY ASSY 12CC
1	0022031233	ARRAY ASSY 12CD
1	0022031234	ARRAY ASSY 12CE
1	0022031235	ARRAY ASSY 12CF
1	0022031236	ARRAY ASSY 12CG
1	0022031237	ARRAY ASSY 12CH
1	0022031238	ARRAY ASSY 12CI
1	0022031239	ARRAY ASSY 12CJ
1	0022031240	ARRAY ASSY 12CK
1	0022031241	ARRAY ASSY 12CL
1	0022031242	ARRAY ASSY 12CM
1	0022031243	ARRAY ASSY 12CN
1	0022031245	ARRAY ASSY 12CP
1	0022031246	ARRAY ASSY 12CQ
1	0022031247	ARRAY ASSY 12CR
1	0022031248	ARRAY ASSY 12CS
1	0022031249	ARRAY ASSY 12CT
1	0022031250	ARRAY ASSY 12CU
1	0022031260	ARRAY ASSY HALFPAK 121HA
1	0022031261	ARRAY ASSY HALFPAK 121HB
1	0022031262	ARRAY ASSY HALFPAK 121HC
1	0022031263	ARRAY ASSY HALFPAK 121HD
1	0022031265	ARRAY ASSY HALFPAK 1214F

Quantity	Part Number	Description
5	0022934304	RETAINER LSI CONN 48 PIN
2	0022934305	HEADER ASSY LSI CONN 48 PIN
5	0022934306	RETAINING SPRING LSI CONN 48 PIN
1	0023051207	PAK ASSY OEJH
1	0023051210	PAK ASSY 7CQH
1	0023051212	PAK ASSY 7BDH
1	0023051214	PAK ASSY 7CFH
1	0023051247	PAK ASSY 7AEH
1	0037101770	OVER VOLTAGE/CURRENT ASSY

MAINTENANCE KIT CYBER 860M

Quantity	Part Number	Description
1	0017965301	LAMP IND ASSY 120 V
1	0018906894	MOD ASSY TEMP PROTECT
1	0020279300	GAUGE PRESSURE LIQUID FILLED
1	0021946267	PAK ASSY 3GSH
1	0021946270	PAK ASSY 3GTH
1	0021946273	PAK ASSY 3GUH
1	0022671590	PAK ASSY 3BBH
1	0023051200	PAK ASSY 3BDH
1	0023051232	PAK ASSY 4BNH
1	0023051253	PAK ASSY 7BMH FCA845,32.855 78
1	0023051255	PAK ASSY OBVH FCA845,32.855 78
1	0023051258	PAK ASSY 4UEH 210
1	0023051259	PAK ASSY 3BSH ZIF
1	0024613177	PAK ASSY 3BVH
1	0024670813	PAK ASSY 3HBH
1	0053812049	MODULE ASSY PWR CONTROL
30	0095558020	TAPE COPPER FOIL
1	0000852001	FAN MUFFIN + BLOCK 115 V 50/60 HZ
1	0010357683	MEM PAK 7EDH TERM FULL POP
1	0010357687	MEM PAK 7EHH W/O TERM FULL POP
1	0011899012	REGULATION ASSY +12 V 2.5 AMP
2	0012117309	CAP ALUM 10 V ELECT
1	0015141400	NUMERIC DISPLAY PL707

COMMON MAINTENANCE KIT

Quantity	Part Number	Description
1	0017609300	FITTING FUSIBLE MALE UNION
1	0017609600	FILTER DRIER CATCH ALL C-164
1	0017610707	VALVE W/COIL, REFRIG 120 V KC2
1	0017610731	VALVE W/COIL, REFRIG 120 V MB19S2
1	0017977302	RELAY TIME DELAY
1	0017981203	CONTACT BLOCK + SWITCH
1	0018370502	REGULATOR VALVE HGBP
1	0018495200	VALVE WATER REGULATING
1	0018565200	RELAY 3PST 3 AMP
1	0018840100	RECT 710A SILICON
1	0018937300	RECT 410 SILICON
1	0019265247	PAK ASSY 7VE0
1	0019265255	PAK ASSY 7VJ0 12/16 BIT CONV
1	0019265321	PAK ASSY 7WG0 PP/CH INTERFACE
1	0019266219	PAK ASSY 7VB0
1	0019266227	PAK ASSY 7WB0
1	0019266253	PAK ASSY 7VX0
1	0019266254	PAK ASSY 7VL0
1	0019266368	PAK ASSY 7VD0
1	0019266609	PAK ASSY 7VS0
1	0019266695	PAK ASSY 7VP0
1	0019266708	PAK ASSY 7WA0
1	0019266725	PAK ASSY 7VF0
1	0019266734	PAK ASSY 7VR0
1	0019267357	PAK ASSY 7WC0
1	0019267393	DEADSTART PANEL ASSY 7WZ0
1	0019267584	PAK ASSY 7VK0
1	0019267655	PAK ASSY 7VA0
1	0019267710	PAK ASSY 7VW0
1	0019268100	PAK ASSY 7VV0
1	0019268127	PAK ASSY 7WF0
1	0019268147	PAK ASSY 7WD0
1	0019268162	PAK ASSY 7VG0
1	0019268299	PAK ASSY 7WE0
1	0019268711	PAK ASSY 7VQ0
1	0022023777	PANEL ASSY
1	0022867200	REG ASSY 2.2 V 25-40 AMP
1	0022932294	REG ASSY 12 V 12 AMP
1	0022938334	SURGE VOLTAGE PROTECTOR
1	0024508600	FUSEHOLDER HKL IND 15 AMP 90-250 V
1	0024512100	RELAY 4PDT 24 V 700 OHM
1	0024527404	SW RTRY 4 POLE 2-5 POS 4 SECT 115 VAC
1	0024561604	RECT 1N1183RA SILICON
1	0024563107	VALVE EXPANSION
1	0024564212	THERMOSTAT
1	0041347800	SW TG PC BD 5 AMP 120 VAC
1	0052561619	THERMISTOR ASSY
1	0052806337	PWR CONT BD ASSY
1	0095662000	RECT MDA952-2 BRIDGE

DIAGNOSTIC AND INSTALLATION KIT

Quantity	Part Number	Description
6	0009035201	ROLL PIN 3/32 DIA X 3/16 LG
1	0010357896	PAK ASSY 7UEH M/CLK CSC
1	0010358290	PAK ASSY 7BVH
1	0021987666	PAK ASSY 7BGH
1	0022012412	PAK ASSY 7CAH
1	0022012415	PAK ASSY 7CJH
1	0022012430	PAK ASSY 7CLH
1	0022012433	PAK ASSY 7CMH
1	0022012436	PAK ASSY 7CNH
1	0022012439	PAK ASSY 7CPH
1	0022012445	PAK ASSY 7CRH
1	0022012457	PAK ASSY 9EKH
1	0022012463	PAK ASSY 7BCH
1	0022012469	PAK ASSY 7BEH
1	0022012484	PAK ASSY 7BMH
1	0022012487	PAK ASSY 7BNH
1	0022013003	PAK ASSY 7BSH
1	0022013009	PAK ASSY 7BWH
1	0022013012	PAK ASSY 7BXH
1	0022013023	PAK ASSY 8DAH
1	0022067161	PAK ASSY 7UCH ADD FAN
1	0022671594	PAK ASSY 7CBH
1	0022724509	PAK ASSY 7UAH
2	0022937525	EXTRACTOR LEFT-HAND
2	0022937526	EXTRACTOR RIGHT-HAND
1	0023051203	PAK ASSY 7BKH
1	0023051206	PAK ASSY 7BHH
1	0023051208	PAK ASSY 7CDH
1	0023051209	PAK ASSY 9ESH
1	0023051215	PAK ASSY 7BYH
1	0023051216	PAK ASSY 7BPH
1	0023051217	PAK ASSY 7BRH
1	0023051218	PAK ASSY 7BUH
1	0023051219	PAK ASSY 7BQH
1	0023051220	PAK ASSY 7BFH
1	0023051221	PAK ASSY 7BJH
1	0023051225	PAK ASSY 9DKH
1	0023051226	PAK ASSY 7CGH
1	0023051248	PAK ASSY 7BTH
1	0053371073	PAK ASSY 7UDH
1	0067304092	PAK ASSY 2IWG

RECOMMENDED TOOLS LIST

Quantity	Part Number	Description	Applicable Equipment
1	0000205362	MALE COAX PIN INSERTION TOOL .030-IN	AD112
1	0000205366	PIN REMOVAL TOOL	AD112
1	0000208879	LSI RETAINER REMOVAL TOOL	AD112
1	0000210866	MALE COAX PIN INSERT TOOL/STRAIGHT	AD112
1	0000210903	MALE COAX PIN STRAIGHTENER	AD112
1	0000213164	TOOL, ARRAY REMOVAL, LSI-168	AD112
2	0000213470	MALE COAX INSERTION, W/O GUIDE	AD112
1	0000215331	INSERTION TOOL LOGIC MODULE	AB115
1	0000215557	GUIDE PIN INSTALLATION TOOL	AD112
1	0000215658	COAX WIRE INSERTION	AD112
1	0000216074	LSI CONNECTOR PIN STRAIGHTENER	AD112
1	0000217093	MALE COAX INSERTION, W/GUIDE	AD112
1	0000217329	LOCATOR LSI PANEL (WIRED SIDE)	AD112
1	0000217372	VELOSTAT, ESD/LSI BOX	AD112
1	0000217698	AUX BOARD PIN SEATING TOOL	AD112
1	0000217805	48/52 CON PIN SEATING TOOL	AD112
1	0000217806	48/52 CON PIN SEATING TOOL	AD112
1	0000218816	LSI PANEL FLATNESS TOOL KIT	AD112
1	0000218250	BLOCK CHECK/ADJUST, LSI REMOVAL TOOL	AD112
1	0000218976	LSI STIFFENER PROTECTIVE BOX	AD112
1	0000219312	POWER BUS BOARD TAPPER	AD112
1	0000219313	HALF-PAK ARRAY INSERTION TOOL	AD112
1	0000219315	TORQUE WRENCH	AD112
1	0000219344	WATER HOSE QUICK DISCON PLIERS	AD112
1	0000219492	LSI PANEL (BOARD) STIFFENER	AD112
1	0000219509	LSI SPRING CLIP TOOL 48 PIN	AD112
1	0000219510	LSI SPRING CLIP TOOL 52 PIN	AD112
1	0010357666	PAK EXTENDER, 136 PAK	AB115
1	0010371100	TOOL WR BOX 1 IN X 1 1/8 IN	AB115
1	0010371101	TOOL WR BOX 1 1/8 IN X 1 IN	AB115
1	0012181199	CABLE ASSY CLOCK TUNING 75 OHM	BS213
1	0012205640	TOOL WR TRQ 100-800	AD112
1	0012206259	TOOL SLDR TIPLET MICRO NEEDLE	AB115
1	0012209280	TOOL WR ADJ 1.687 OE 15 IN O/A	AB115
2	0012210275	TWEEZERS	AD112
1	0012210434	MA KNIFE X-ACTO 5 IN W/BLADE	AB115
1	0012210435	MA BLADE X-ACTO NO 11 PT PKG 5	AB115
1	0012210436	TOOL SLDR DESLDR TOOL	AB115
1	0012210437	TOOL SLDR RESIN CORE 60/40 1 LB	AB115
1	0012210636	WIRE WRAP BIT, 30 GA .043	AD112
1	0012210730	10-IN ADJUSTABLE WRENCH	AD112
5	0012210768	TOOL SLDR TIPLET CHISEL	AB115
1	0012210773	TOOL INSR TAPER PIN W/TIP SM	AB115
1	0012210816	TOOL HOOK SPRING SMALL	AB115
1	0012210829	TOOL WR ADJ 1.312 OE 12 IN O/A	AB115
1	0012210876	TOOL SCRIBE TIP STRAIGHT	AB115
1	0012210926	TOOL WR TRQ 0-150 IN LB 3/8 DR	AD112
1	0012210943	TOOL MIRROR DENTAL INSPECTION	AD112
1	0012210945	TOOL MIRROR DENTAL INSPECTION	AD112
1	0012210991	TOOL PSYCHROMETER SLING TAYLOR	AB115
1	0012211612	TOOL GAUGE PRESSURE REF 7600	AB115

Quantity	Part Number	Description	Applicable Equipment
1	0012212053	GAGE + LINE SERVICE	AB115
1	0012212056	TOOL KIT ACID PUMP	AB115
1	0012212057	TOOL WR RATCHET MULT HEX/SQ DR	AB115
3	0012212196	TOOL INTGD CKT TEST CLIP	AB115
3	0012215129	TEST PROBE SCOPE TIP, ZIF	AD112
1	0012215133	TEST PROBE SCOPE P6101	AD112
1	0012215145	HIGH INTENSITY LIGHT	AD112
1	0012215152	TEST PROBE SCOPE X10 P6160	AB115
3	0012215173	TOOL ADAPTER SCOPE PROBE	AB115
1	0012215195	DISPOSABLE GLOVES	AD112
1	0012218402	WIRE WRAP BIT, 30 GA	AD112
1	0012259111	GUN WIRE WRAPPING	BS213
1	0012259132	TOOL EXTRACTOR COAX CONNECTOR	AB115
1	0012259135	TOOL MAGNIFIER 6X W/O RETICLE	AB115
1	0012259145	WIRE WRAP BIT, 30 GA 1036	BS213
1	0012259150	TOOL SHOCK TEST TIP/ADP 25 PAK	AB115
1	0012259183	TOOL WIRE UNWRAP 30 GA	BS213
1	0012262503	TOOL HEAT GUN 115 V	AB115
1	0012262555	TOOL WIRE STRIPPER 30 GA .014	AB115
1	0012262599	TOOL TWEEZER CURVE 4.500	AB115
1	0012263214	TOOL SLDR IRON 45W-120 V 3 W	AB115
1	0012263216	TOOL SLDR IRON 27W-120 V 3 W	AB115
1	0012263227	TOOL RECTIFIER INSTALLATION	AD112
1	0012263279	TEST MULTIMETER 8020A DIGITAL	AD112
1	0012263292	MA QUIK FREEZE	AB115
1	0012263294	MA BRUSH W/AEROSOL ADPT	AD112
1	0012263417	PIN VISE	AD112
2	0012263423	PROBE SCOPE 50 OHM P6056, 9 FT	AD112
1	0012263442	SOCKET 1 1/4 MODIFIED	AD112
1	0012263445	PROBE TEMPERATURE 80T-150F	AB115
1	0012263451	POWER SUPPLY, CURRENT CHECK	AD112
1	0012263461	FUNNEL, FOLDING	AD112
1	0012263466	CURRENT SHUNT	AD112
1	0012263483	MICSCOPE VB-73 .7*-3X W/EYEPIECE	AD112
1	0012263484	STAND, MICROSCOPE	AD112
1	0012263485	ARM, MICROSCOPE	AD112
1	0012263487	EYEPIECE (10X)	AD112
1	0012263495	PAD ANTI-STATIC	AD112
1	0012263496	STRAP, WRIST, STATIC CONTROL	AD112
4	0012263499	BAG, SHIELDING, ANTISTATIC, 14 X 18	AD112
1	0012263512	FREON TMS MS165 16 OZ	AD112
1	0012263513	TRICHLOROETHANE MS170 16 OZ	AD112
2	0012263585	DRILL BIT .0225	AD112
1	0012263587	MICROSCOPE EYEPIECE 10X, PAIR	AD112
1	0012263623	STRAP, WRIST, STATIC, SMALL	AD112
3	0012263635	ADAPTER, PROBE TIP, INTECH	AD112
1	0012263639	LIGHT, MICROSCOPE	AD112
1	0012263640	LIGHT, MICROSCOPE POWER PAK	AD112
3	0012263642	PROBE, STRAIN RELIEF, INTECH	AD112
1	0015429850	COMPOUND, THERMAL INSULATING	AD112
1	0015438020	SOL, TRICHLOROETHANE MA 170	AD112
1	0018697523	TEST HOOK TIP FOR SCOPE PROBES	AB115
1	0018988244	BOARD BUS STRAIGHTENER ASSY	AD112
2	0021935406	ZIF ALIGNMENT GAUGE	AD112

Quantity	Part Number	Description	Applicable Equipment
1	0021961212	REPLACEMENT CONTACT ELFAB .125	AD112
1	0021987490	POSITION TWO CLIP REMOVAL TOOL	AD112
1	0022724699	DRAIN HOSE	AD112
1	0022733345	FILTER CARTRIDGE 0.45 UM	AD112
1	0022733355	FILTER CARTRIDGE MIXED RESIN	AD112
1	0022824498	COBRATEC TT-50S	AD112
1	0023004600	COAX CLIP REMOVAL TOOL	AD112
1	0023004633	HANGER PROBE DC	AD112
1	0023004652	GAUGE ALIGNMENT ZIF	AD112
1	0023004655	POSITION 20 CLIP REMOVAL TOOL	AD112
1	0023004660	LSI WIRE REMOVAL TOOL	AD112
1	0023004661	LSI ARRAY HOLDER EM	AD112
3	0023004668	SCOPE PROBE EXTENDER	AD112
3	0024613109	PROBE TIP LSI/AUX	AD112
1	0024614635	ZIF BOARD EXTENDER	AD112
1	0024614928†	CABLE ASSY, COAX 59 IN, ZIF/ZIF	AD112
1	0024615025†	CABLE ASSY, COAX 55 IN, LSI/ZIF	AD112
1	0024615122†	CABLE ASSY, COAX 47 IN, LSI/LSI	AD112
1	0037103960	PROBE TIP LSI LOGIC ANALYZER	AD112
2	0051730100	MA SAFETY GLASSES	AD112
1	0052806381	STIFFENER POWER BUS BOARD	AD112
1	0052806385	REMOVAL/INSERTION TOOL, LSI ARRAY	AD112
1	0052807047	ROLL PIN INSERTION TOOL	AD112
1	0052807899	LSI PANEL REPAIR KIT	AD112
1	0052948476	LOGIC BOARD EXTENDER	BS213
1	0053581615	NALCO 2594 MICROBIOCIDE	AD112
1	0053586616	FUNNEL	AD112
1	0053586686	ALKALINITY KIT	AD112
3	0053705483	CLIP SCOPE, 100K	AD112
2	0053705652	DRAIN HOSE ZIF	AD112
1	0053705801	PAKS MIRROR AUX	AD112
1	0053705852	FILTER, WATER ASSY	AD112
1	0053812060	CONTACT REPLACEMENT KIT	AD112
1	0058013800	ARRAY BOARD EXTENDER	BS213
1	0091915206	ARRAY BOARD EXTENDER	BS213
1	0094211400	MA CLOTH CLEANING LINT FREE	AB115
1	0094657900	MA GREASE THERMAL 128 COMPOUND	AD112
1	0095055800	SOL, FREON TMS 165	AD112
1	0095353800	ELEC COND GREASE (EJC NO 2)	AD112

RECOMMENDED REGIONAL/COUNTRY TOOLS

Quantity	Part Number	Description	Applicable Equipment
1	0000213354	PRESS, LSI INSERTION	AD112
1	0000219356	LSI INSERTION PRESS SUPPORT	AD112
1	0024614635	EXTENDER, CARD ZIF	AD112
1	0053705665	KIT CONNECTOR, REPAIR ZIF	AD112

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† Intended for use as a troubleshooting aid.

GENERAL-PURPOSE PARTS

Part Number	Description	Applicable Equipment
0000815436	AIR FILTER	BS213
0000815491	AIR FILTER	AB115
0000815800	KNOB BAR TYPE .25 IN	AD112 BS213
0000863800	KNOB CONTROL	AD112 BS213
0010126956	TRANSFORMER 5.15V 750A	AD112
0010353250	MODULE ASSY CLOCK REG	BS213
0010353670	BOX PWR SUPPLY 12 V ASSY	AB115
0010354853	CIRCUIT BRKR 400 HZ 4 POLE	AB115
0010357873	CLOCK PWR SUPPLY ASSY	BS213
0010358563	VOLTAGE REGULATOR	AD112
0011896086	BACKPANEL ASSY ZIF	AD112
0011896340	TRANSFORMER 3V 350A T2	AD112
0011896599	THERMISTOR TUBE ASSY 10K	AB115
0011897770	CABLE ASSY COAX 75 OHM CLK 9.00 IN	AB115
0011897771	CABLE ASSY COAX 75 OHM CLK 61.75 IN	BS213
0011897772	CABLE ASSY COAX 75 OHM CLK 73.75 IN	BS213
0011897773	CABLE ASSY COAX 75 OHM CLK 83.00 IN	BS213
0011897774	CABLE ASSY COAX 75 OHM CLK 92.25 IN	BS213
0011897775	CABLE ASSY COAX 75 OHM CLK 100.0 IN	BS213
0011899608	PLATE 20 PIN CONNECTOR	AB115 BS213
0012089230	RELAY 2 AMP	AD112
0012089232	RELAY 500MA	AD112
0012117500	CAP ALUM 20 V ELECT	BS213
0012117604	CAP ELECTROLYTIC 25 V DC	BS213
0012117700	CAP 50. KUF 30 V ELECT	AB115
0012126902	CIRCUIT BRKR 1 POLE 400 HZ	AB115
0012181199	CABLE ASSY COAX 75 OHM CLOCK TUNING	BS213
0012211611	POT MODEL 2715B T/C	AB115
0012263215	SOLDER, ADAPTER/TIP FOR 27W/45	AD112
0012263509	ACOUSTIC COUPLER	AB115
0012263528	HP SCOPE 1725A	AB115
0015182000	TRANSFORMER 3V 400A 400HZ	BS213
0016431600	RECTIFIER JEDEC TYPE 1N4719	AD112
0017620001	JACK BANANA RED	BS213
0017620004	JACK BANANA BLUE	BS213
0017855600	TRANS FIL 50/60 HZ 24 V 1 AMP	AB115
0017977304	RELAY TIME DELAY 4PDT 120 V DIAL	AB115
0017981205	CONTACT BLOCK + SWITCH	AB115
0017981302	CONTACT BLOCK + SWITCH	AB115
0018287502	DIODE SILICON	BS213
0018336403	RELAY DPDT 115VAC	AD112
0018336409	RELAY PLUG IN	AD112
0018435600	VOLTMETER DC, EXTERNAL MULTI	AB115 BS213
0018440703	CIRCUIT BRKR 13A 4 POLE 250 V 400 HZ	BS213
0018440706	CIRCUIT BRKR 7.5 AMP 4 POLE 250 V 400 HZ	AB115
0018440709	CIRCUIT BRKR 3. AMP 4 POLE 250 V 400 HZ	BS213
0018440710	CIRCUIT BRKR 2. AMP 4 POLE 250 V 400 HZ	AB115
0018440714	CIRCUIT BRKR 15. AMP 4 POLE 250 V 400 HZ	AD112
0018684700	TRANSFORMER AUTO STEPDOWN 3 PH	AB115

Part Number	Description	Applicable Equipment
0018697569	TEST EQUIP SCOPE 475	BS213
0018906200	RELAY POWER 25 AMP 4PDT 6 VDC COIL	AD112
0018906205	RELAY POWER 25 AMP 4PDT 120 VAC COIL	AD112 BS213
0018906894	MOD ASSY TEMP PROTECT	AD112
0019265421	CABLE ASSY 170 CHANNEL	AB115
0019265423	CABLE ASSY DEAD START PANEL	AB115
0019265633	PANEL ASSY DEADSTART	AB115
0019266038	CABLE ASSY MEM PORT	AB115
0019266070	CABLE ASSY 170 CHANNEL	AB115
0019266318	CABLE ASSY 2 PORT MUX TERM	AB115
0019266450	CONNECTOR ASSY 30 POS	AB115
0019266451	CONNECTOR ASSY 20 POS	AB115
0019266481	CONNECTOR ASSY 28 POS	AB115
0021925154	TRANSFORMER 115 W 36/18 V	AB115
0022013032	INTERCONNECT LM BD. C1A	AD112
0022013035	INTERCONNECT LM BD. C1B	AD112
0022013038	INTERCONNECT LM BD. B1B	AD112
0022013041	INTERCONNECT LM BD. B1A	AD112
0022647106	WIRE TWPR BLK/BLUE 50 FT ROLL	AB115
0022669100	GUIDE CARD 24 POS	AB115
0022672036	REFLECTIVE TAPE	BS213
0022679417	REGULATOR ASSY 2.2V	AD112
0022786541	BLOWER CENTRIFUGAL 80 CMF	BS213
0022845800	TRANSFORMER 400A 6.6 V 3 PHASE 400 HZ	BS213
0022933497	COND UNIT 3 TON	AB115
0022934090	COMPRESSOR 208/240 V 3 HP 60 HZ	AB115
0022934095	CONDENSER VERT 3 HP	AB115
0022934267	GAUGE REFRIGERANT	AB115
0022934268	GAUGE REFRIGERANT PRESSURE TMP	AB115
0022936973	SW TOGGLE PC MOUNT	AB115
0022936975	SWITCH TOGGLE	AB115
0022937009	CONNECTOR COAXIAL-75 OHM BNC	AB115
0022937010	CONNECTOR COAXIAL-75 OHM BNC	AB115
0022937033	CABLE COAX 75 OHM LOW LOSS	BS213
0022937976	CABLE ASSY COAX 75 OHM 27.25 IN	BS213
0022938297	TRANSFORMER 2.7 V 600 AMP 400 HZ	AB115
0022938298	TRANSFORMER 5.7 V 750 AMP 400 HZ	AB115 BS213
0023007400	CONNECTOR PLUG 16 PIN	AB115
0023007401	CONNECTOR CABLE 16 PIN	AB115
0023007402	CONNECTOR CABLE CLAMP SHELL 16 PIN	AB115
0023051253	PAK ASSY 7BMH FCA845,32.855 78	AD112
0023051266	BD INTERCONNECT CMC1 AIA	AD112
0023051267	BD INTERCONNECT CMC1 AIB	AD112
0023253800	TRANSFORMER VAR 5KVA	AD112
0024501733	CAP., FIXED CERAMIC .001UF 50 V	AB115
0024501747	CAP., FIXED, CERMIC .100UF 50 V	AB115
0024512922	FUSE 1.500 AMP 250 V GL F-A AGC	BS213
0024513001	FUSE 15.000 AMP 250 V CER F-A ABC	AB115
0024513005	FUSE 3.000 AMP 250 V CER F-A ABC	AB115
0024513600	SW TG DPDT 10 AMP 250 V SCR-TERM	AD112
0024516000	SW TG SPST 2 POS 3 AMP 250 V	AB115
0024529103	TRANSFORMER PRI 120/240 V	AB115
0024550900	SW TG DPST 2 POS 15 AMP 120 VAC SLDR	BS213
0024551508	CONTACT PINS 18-16 GA	AB115

Part Number	Description	Applicable Equipment
0024553368	RESISTOR 50 W 0.016 OHMS WW	AD112
0024564207	THERMOSTAT NAR DIFF 110 F	BS213
0024564210	THERMOSTAT 95 F	AB115
0024564213	THERMOSTAT 120 F	AB115
0024564223	THERMOSTAT 130 F	BS213
0024571702	SW TG SPDT 2 POS	AB115
0024614890	CABLE	AD112
0024614901	CABLE ASSY-COAX 5 IN - ZIF/ZIF	AD112
0024614902	CABLE ASSY-COAX 7 IN - ZIF/ZIF	AD112
0024614903	CABLE ASSY-COAX 9 IN - ZIF/ZIF	AD112
0024614904	CABLE ASSY-COAX 11 IN - ZIF/ZIF	AD112
0024614905	CABLE ASSY-COAX 13 IN - ZIF/ZIF	AD112
0024614906	CABLE ASSY-COAX 15 IN - ZIF/ZIF	AD112
0024614907	CABLE ASSY-COAX 17 IN - ZIF/ZIF	AD112
0024614908	CABLE ASSY-COAX 19 IN - ZIF/ZIF	AD112
0024614910	CABLE ASSY-COAX 23 IN - ZIF/ZIF	AD112
0024614914	CABLE ASSY-COAX 31 IN - ZIF/ZIF	AD112
0024614915	CABLE ASSY-COAX 33 IN - ZIF/ZIF	AD112
0024614916	CABLE ASSY-COAX 35 IN - ZIF/ZIF	AD112
0024614917	CABLE ASSY-COAX 37 IN - ZIF/ZIF	AD112
0024614918	CABLE ASSY-COAX 39 IN - ZIF/ZIF	AD112
0024614919	CABLE ASSY-COAX 41 IN - ZIF/ZIF	AD112
0024615006	CABLE ASSY-COAX 17 IN - LSI/ZIF	AD112
0024615007	CABLE ASSY-COAX 19 IN - LSI/ZIF	AD112
0024615008	CABLE ASSY-COAX 21 IN - LSI/ZIF	AD112
0024615009	CABLE ASSY-COAX 23 IN - LSI/ZIF	AD112
0024615010	CABLE ASSY-COAX 25 IN - LSI/ZIF	AD112
0024615011	CABLE ASSY-COAX 27 IN - LSI/ZIF	AD112
0024615012	CABLE ASSY-COAX 29 IN - LSI/ZIF	AD112
0024615013	CABLE ASSY-COAX 31 IN - LSI/ZIF	AD112
0024615014	CABLE ASSY-COAX 33 IN - LSI/ZIF	AD112
0024615015	CABLE ASSY-COAX 35 IN - LSI/ZIF	AD112
0024615016	CABLE ASSY-COAX 37 IN - LSI/ZIF	AD112
0024615017	CABLE ASSY-COAX 39 IN - LSI/ZIF	AD112
0024615018	CABLE ASSY-COAX 41 IN - LSI/ZIF	AD112
0024615019	CABLE ASSY-COAX 43 IN - LSI/ZIF	AD112
0024615020	CABLE ASSY-COAX 45 IN - LSI/ZIF	AD112
0024615021	CABLE ASSY-COAX 47 IN - LSI/ZIF	AD112
0024615022	CABLE ASSY-COAX 49 IN - LSI/ZIF	AD112
0024615023	CABLE ASSY-COAX 51 IN - LSI/ZIF	AD112
0024615024	CABLE ASSY-COAX 53 IN - LSI/ZIF	AD112
0024615101	CABLE ASSY-COAX 5 IN - LSI/LSI	AD112
0024615102	CABLE ASSY-COAX 7 IN - LSI/LSI	AD112
0024615103	CABLE ASSY-COAX 9 IN - LSI/LSI	AD112
0024615104	CABLE ASSY-COAX 11 IN - LSI/LSI	AD112
0024615105	CABLE ASSY-COAX 13 IN - LSI/LSI	AD112
0024615106	CABLE ASSY-COAX 15 IN - LSI/LSI	AD112
0024615107	CABLE ASSY-COAX 17 IN - LSI/LSI	AD112
0024615108	CABLE ASSY-COAX 19 IN - LSI/LSI	AD112
0024615109	CABLE ASSY-COAX 21 IN - LSI/LSI	AD112
0024615110	CABLE ASSY-COAX 23 IN - LSI/LSI	AD112
0024615111	CABLE ASSY-COAX 25 IN - LSI/LSI	AD112
0024615112	CABLE ASSY-COAX 27 IN - LSI/LSI	AD112
0024615113	CABLE ASSY-COAX 29 IN - LSI/LSI	AD112

Part Number	Description	Applicable Equipment
0024615114	CABLE ASSY-COAX 31 IN - LSI/LSI	AD112
0024615115	CABLE ASSY-COAX 33 IN - LSI/LSI	AD112
0024615116	CABLE ASSY-COAX 35 IN - LSI/LSI	AD112
0024615117	CABLE ASSY-COAX 37 IN - LSI/LSI	AD112
0024615118	CABLE ASSY-COAX 39 IN - LSI/LSI	AD112
0024615119	CABLE ASSY-COAX 41 IN - LSI/LSI	AD112
0024615120	CABLE ASSY-COAX 43 IN - LSI/LSI	AD112
0024615121	CABLE ASSY-COAX 45 IN - LSI/LSI	AD112
0024932158	CABLE ASSY-DIFF 19 IN - ZIF/ZIF	AD112
0024932159	CABLE ASSY-DIFF 25 IN - ZIF/ZIF	AD112
0024932171	CABLE ASSY-COAX 39 IN - ZIF/ZIF	AD112
0024932194	CABLE ASSY-DIFF 138 IN- ZIF/ZIF	AD112
0030002000	TRANS VAR 400 HZ 208 V 1 KVA	AB115
0030090600	TRANS VAR 120 V 3 KVA	BS213
0037101712	SCR HIGH POWER	AD112
0037104593	MOD ASSY 5V REGULATOR	BS213
0037104724	MOD ASSY POWER CONT	BS213
0037104740	MOD ASSY AIRFLOW	BS213
0038963902	TEST JACK BLACK	BS213
0038963907	SWITCH THERMAL 120 VAC 130 F	BS213
0050241401	DIODE SCHOTTKY BAR SILICON	AB115
0051683714	CIRCUIT BRKR 2. AMP 250 V THERMAL	AB115
0051808103	SW THERMAL	AB115
0051854907	BLOWER CENT 230 VAC 850 CFM	AB115
0051899704	FILTER RFI 10 AMP SOLDER	AB115
0051903800	DIODE LED RED	AB115
0052653380	CABLE ASSY ZIF	AD112
0052681559	CABLE ASSY COAX 75 OHM CLK 107.9 IN	BS213
0052681560	CABLE ASSY COAX 75 OHM CLK 117.1 IN	BS213
0052681561	CABLE ASSY COAX 75 OHM CLK 126.4 IN	BS213
0052682402	CONTACTOR 3 HP 27 AMP	AB115
0052723900	FILTER SUCTION	AB115
0052757000	TRANSFORMER	AB115
0052763201	HOSE REFRIGERATION	AB115
0052801308	METER MULTIPLIER ASSY	AB115
0052807008	SENSOR DEWPOINT ASSY	AD112
0052807009	SENSOR DEWPOINT PROBE	AD112
0052807821	CONTACTOR 40A 50-400 HZ	BS213
0052921900	CONTROL PRESSURE HIGH SPST	AB115
0052922000	CONTROL PRESSURE LOW SPST	AB115
0052948417	LSI PANEL ASSY AC	AD112
0052948418	LSI PANEL ASSY IU1	AD112
0052948419	LSI PANEL ASSY IU2	AD112
0052948420	LSI PANEL ASSY BDP	AD112
0052948421	LSI PANEL ASSY IU3	AD112
0052948422	LSI PANEL ASSY ALN	AD112
0052948423	LSI PANEL ASSY M/D	AD112
0052948480	REFRESH SWITCH ASSY	AD112
0053142344	AIR SEAL ASSY	AB115
0053549300	BUSHING ISOLATION	AB115
0053586100	WATER PUMP	AD112
0053705665	KIT BACKPANEL REPAIR	AB115
0053812072	GAUGE FLOWMETER WATER	AD112
0053915605	AIRFLOW SENSOR ASSY THER SW 150 F	AB115

Part Number	Description	Applicable Equipment
0056030004	CIRCUIT BRKR 3 POLE 600 V	AB115
0056296804	TRANSFORMER PWR CONT	AB115
0059121410	CABINET STORAGE W/O SHELVES	AB115
0059121420	SHELF METAL FOR STORAGE CABINET	AB115
0062032106	CABLE ASSY, DATA SET 50 FT	AB115
0067045510	LINE WATER PUMP LEFT SIDE	AD112
0067045754	LINE WATER PUMP RT SIDE	AD112
0067327671	MOD ASSY THETA PWR CONT DR	AD112
0067327673	MOD ASSY THETA PWR CONT I/O	AD112
0067327675	MOD ASSY THETA PWR CONT	AD112
0093942006	CONTACT PIN NO 18-14 SER .090	AB115
0093943005	CONTACT SKT NO 22-18 SER .090	AB115
0093943006	CONTACT SKT NO 18-14 SER .090	AB115
0093943009	CONTACT SKT NO 30-22 SER .090	AB115
0093948007	CONNECTOR RCPT SQ 6 PIN CAVITY	AB115
0094091002	CONNECTOR RCPT 8 PIN	AB115
0094245600	CONTACT CRIMP INSERT	AB115
0095587054	CIRCUIT BRKR 1 POLE 4. AMP	BS213
0095587064	CIRCUIT BRKR 1 POLE 7 AMP	BS213

LSI BOARD REPAIR PARTS

CAUTION

Soldering or unsoldering must be performed by a person with a current soldering certification that applies to the techniques required for repair of LSI board connector pins.

Part Number	Description	Applicable Equipment
00213354	PRESS LSI INSERTION	AD112
11896735	PIN, ECO, 52-PIN CONNECTOR, BOTTOM, RAW	AD112
11896736	PIN, ECO, 52-PIN CONNECTOR, SIDE, RAW	AD112
11899085	PIN, ECO, 26-PIN CONNECTOR, RAW	AD112
12210903	SWAB	AD112
12215144	SOLDER	AD112
12262519	EPOXY KIT, ADHESIVE, 2 TUBES	AD112
12263229	WICK, SOLDER 5 FT	AD112
12263235	STATION, SOLDERING 60 WA	AD112
12263241	FLUX, BOTTLE APPL	AD112
12263242	FLUX, SOLDER 1 PT	AD112
12263295	REMOVER, FREON FLUX	AD112
12263640	LIGHT, MICROSCOPE POWER PAK	AD112
12263656	LAMP, MICROSCOPE	AD112
12263659	LAMP HOUSING, MICROSCOPE	AD112
15165200	WIRE, BLUE	AD112
15165201	WIRE, RED	AD112

Part Number	Description	Applicable Equipment
15165497	WIRE, TWISTED PAIR, 38 GA	AD112
22936605	GROUNDING CLIP, COLD TUBE, SOLDERED	AD112
22937110	TUBING, HEAT SHRINK (FOR RAW ECO PINS)	AD112
22938269	PIN, COAX, MALE, BACKPANEL	AD112
24563020	RESISTOR, 120 OHM	AD112
24563068	RESISTOR, 75 OHM	AD112
24563072	RESISTOR, 200 OHM	AD112
24563723	TUBING (SLEEVING FOR RESISTORS)	AD112
52653365	CONTACT, MALE	AD112
52653368	PIN ASSY, COAX, MALE	AD112
52653373	PIN, ECO, 26-PIN CONNECTOR, INNER LEG	AD112
52653374	PIN, ECO, 26-PIN CONNECTOR, OUTER LEG	AD112
52653376	PIN, ECO, 52-PIN CONNECTOR, OUTER LEG, SIDE	AD112
52653377	PIN, ECO, 52-PIN CONNECTOR, INNER LEG, SIDE	AD112
52653843	PIN, ECO, 52-PIN CONNECTOR, OUTER LEG, BOTTOM	AD112
52653844	PIN, ECO, 52-PIN CONNECTOR, INNER LEG, BOTTOM	AD112
52682096	BUSHING, MALE, ECO-PIN	AD112

COMMENT SHEET

MANUAL TITLE: CDC CYBER 180 Computer System
Models 845S, 855S, 840A, 850, and 860A
Central Processor
Maintenance and Parts Data

PUBLICATION NO.: 60463440 **REVISION:** A

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Models 845S, 855S, 840A, 850, and 860A
Central Processor
Maintenance and Parts Data
60463440 A